HARPER & ROW CARES ABOUT CALCULUS

1. Why ~~I~~ am studying perceptual illusions
Because they help to ~~see~~ discover problems that under normal conditions (would not be noticed) are hidden

F.ex look at a wall. Problem?

Ganzfeld experiment or g. field illusion (Metzger)
Very big wall, homogeneous in color
Person sitting on a very high chaise, ~~but not~~
110 feet away, looking at the wall
(he cannot see other objects)
Fog. Why?

The most simple perception is three dimensional

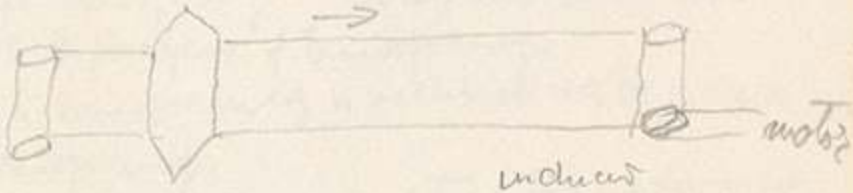
But not only this problem. Another problem has to be solved: Why do we see a wall when there is a wall? Which are the conditions necessary to see it?

2.  what do you see

<u>apparent rest</u> – successive completion
Wittmann (B)
Werner & Wolfson

a) variations of conditions
at least one part of the contour has to correspond to the trajectory of a point.

HARPER & ROW CARES ABOUT CALCULUS



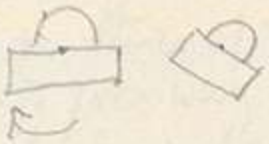
induced motion

poles – wires

b) what happens at the stimulus level

(apart from the lens problem on the retina)

exactly what happens if you move the rectangle upon a circle.



No problem? Why so we see in both cases one part moving and one part stay

c) Kinetically active borders and K. non active borders

shifting and non shifting borders

also <u>sorting</u> objects have kinetically non-active borders

Simple empiricists
naive realism

3. Perception of transparency
   a) ph. transparency is not sufficient to give rise to the perception of transparency
   b) ph. transparency is not necessary to perceive transparency.

Th. tr. cannot explain perceptual transparency

Every cell of the retina is stimulated by a mixture of rays of different wavelengths and gives way to an impression corresponding to the laws of color mixture.

The problem is "When does a mixture of rays ~~give~~ stimulating the retina produce two colors, one behind the other?"

Figural and color conditions

Transparency as color fission

fission colors are such that ~~put~~ mixed together they give again the stimulus-color.

Talbot's law — color mixture
— color fission

4. Perception of a hole

Beck
film color

One-sided function of borders

(Koffka)

A closed contour requires an inside surface, which in this case is obtained at the expense of the surface behind that splits panoramically, being perceived as a surface inside the contour and as a "amodal" continuation of the surface behind.

from – separate images on the 2 eyes

The contrary of the gestalt

Now ~~not~~ a real surface was not seen
a not existing surface was seen

The function of perceptual illusions in research

(a

1. Definition attributes of a perceptual configuration and corresponding characteristics of the target

2. Two ways to consider Perceptual Illusions

a) Exceptions perceptual apparatus does not function well, not giving as always trustworthy information about real world (interesting special problems)

b) Alarm signals (important problem reflected)*

Breaks in the circuits of our naive realism through which the difference between perceptual and real becomes visible.

* Force to see a problem where no problem seemed to be.

3. Distinction between perceptual and real is fundamental, ~~and is easy to recognise~~ but also the specialist goes out to naive realism (denial of such distinction) in common life. Apparently necessary in order to live a normal life, to ignore or to disregard this difference.

4. Ways to preserve naive realism.

stumbling in a trap "I did not notice it"

car accident (sometimes) "I did not see the person"

(4.) [In fact, according to the distinction (perceptual and real environment) the step, or the person did not exist in our perceptual environment]

Explanations mean that we should have been able to see the object, changing direction of look or attention: perceptual apparatus functioning exactly, we do not use it the right way

5. Impossibility of preserving the naive realism in case of perceptual illusions. Explanation does not function.

Example of Ganzfeld phenomenon
Not wall but fog. Why? Special explanation

6. Widening of the problem. Sudden discovery that ~~also~~ it was only a part of the problem. Not only conditions ~~acting~~ when we do not see the wall, but also necessary conditions had to be found out – to see a wall when there is a wall. [why color condensed on a surface at a distance and before it colorless transparent space?]. And why only a wall, and not a book, a person etc.

In this sense Perc. ill. are precious signals forcing us or aiding us to acknowledge a problem where there seemed to be no problem, and everything appeared obvious.

The perceptual world, the only etc.

The function of perceptual illusions in research

The research environment

As the subject of this paper are perceptual illusions, it is perhaps useful to begin with a definition. According to ~~a famous specialist of this subject~~, Professor Rausch ~~of the University of Frankfurt in Germany~~, it is a case to speak of a perceptual illusion when the attributes of a perceived configuration differ from the corresponding characteristics of the target.

I give an example from the well known geometric optical illusions (Müller Lyer) Fig. 1 in order to clarify the meaning of the concepts of target and perceptual configuration(1). But the demonstrations in this paper will not concern the geometric-optical illusions.

At this point it is quite natural to ask the following question. Why have the ~~other~~ perceptual illusions an important place in almost every handbook of Psychology? Are not the illusions unimportant little problems which only a pedant can choose as an object of research?

Such a radical point of view was represented by ~~the famous American Psychologist~~ James Gibson, a dear friend of mine who died ~~x~~ years ago. We discussed several times this topic, the last time some month be-

(1) In the Target the parallel segments of the Müller-Lyer figure are equal, while in the perceptual configuration they are unequal

aim

~~To make the importance of the P. Ill.~~
~~Two opposite points of view about P. Ill.~~ 2

fore his end.

At my opinion there is a special reason to stress the importance of perceptual illusions. I'll begin with stating briefly my theoretical standpoint; however the main part of this ~~seminar~~ paper will consist in demonstrating and discussing some phenomena which will serve to illustrate the Theory.

At the beginning, but not only at the beginning but often also nowadays, the illusions were considered as exceptions, wherein our sensory apparatus did not function well, and therefore did not give, as ~~they~~ it always do, true and trustworthy information about the real world. They were studied and are still studied as interesting special problems.

A point of view that never has been completely put aside is that the sensory apparatus cannot lie, and therefore higher functions have been looked for, interfering with sensory data and being the origin of perceptual illusions.

It is however possible to consider perceptual illusions in a quite different way. According to this point of view they are considered alarm signals, breaks in the cuirass of our naive realism, through

which the difference between perceptual world and real becomes directly visible.

The very function of perceptual illusions is to force us to see a problem where before there seemed to be no problem at all.

It has been always very interesting for me to ascertain that not only the layman, the ordinary man, but also the specialist, who founded all his research on the difference between perceptual and real falls back, in his common life and behavior, to naive realism in an absolutely natural way: what he sees is a car, and not a moment his thinking that it is the perception of a car.

It is apparently necessary, in order to live a normal life, to ignore or at least to disregard the difference between perceptual world and reality (behavioral and geographical environment, according to Koffka's originary concepts).

(2) K. Koffka, Principles of Gestalt Psychology, Cap. II

We have a typical way to defend ourselves and to preserve our realism. If we stumble in a step we simply say that we did not see or did not notice it. And in the same way we often explain the tragic happening of a car accident: we did not see the person. It is clear that, according to the previous distinction between behavioral (or perceptual) and geographical (or real) environment, the step, or the person did not exist in our perceptual world. But with our explanation we are meaning that we ~~would~~ should have been able to see the object under discussion, if we had only changed the direction of our look, or if we had changed the concentration of our attention. What we mean is that the ~~the~~ perceptual apparatus was functioning exactly, but we did not use it in the right way.

But there are cases, and these are just the perceptual illusions, where this explanation does not hold ~~function~~. In these cases, direction of look and attention do not help to perceive what really is there.

Let us take as an example the famous Lanzfeld experiment of Wertheimer and Metzger. There is a wall in front of us, and we see

just fog. In this case there is no way to escape the problem, to make it disappear. The phenomenon change in attention or in directing of the look does not change what we are seeing. This type of phenomena generates a crisis of our naive realism.

We have to explain why we do not see the wall, although it is in front of us.

Our first attitude in these cases is to look for a solution of the illusion as a special limited phenomenon. ~~Only~~ What we ask is: why did ~~our perceptual apparatus~~ ~~in this special case~~ not regularly function in this special case ~~our perceptual apparatus, which~~ although as a rule it gives us a true reproduction of reality?

This is the natural way to follow, at first, for every perceptual illusion. It is like we behave if in an old building, a piece of plaster falls from a wall and we get it repaired so that the color is almost homogeneous and for the superficial observer there is no fault to see. The same can happen a second, a third time. But sooner or later the whole plaster falls, and to the big amazement and happiness we discover that ~~under the~~ a fresco was hidden under the plaster.

Ganzfeld

Something similar happens, sooner or later, when a perceptual illusion is studied [Not in right]

Let us go back to the Ganzfeld-Phenomenon. The first, and more natural question is "Why don't we see the wall?" But suddenly – after a more or less long delay – we discover that this is only a partial problem. Then we ask ourselves not only under which conditions we see fog instead of a wall, but also under which conditions we do see a wall, when a wall is really in front of us. Why do we see, in this case, the color condensed on a surface in front of us, and, before it, colorless transparent space? And why does the problem concern only the wall? Under which conditions do we see a chair, a desk, a book when these objects are lying in front of us?

In this sense the Perceptual illusions are precious signals forcing us or aiding us to acknowledge a problem where there seemed to be no problem and everything appeared to be obvious. In this sense the Perceptual illusions took an important part to the birth of the modern perception psychology and convinced us perception psychologists (I think at least the

the majority of us) that the perceptual world, – the only world with which we have direct contact – is all a lot of problems, which have to be discovered – and this is often the most serious difficulty – before trying to solve them.

With this assertion I am ending the first part of my ~~talk~~ paper. Now I'll try to show – using as examples some perceptual illusions which have been observed and studied by my collaborators and me, – the development of the problems according to what I said before, that is to show how from a limited special problem, a wider insight develops.

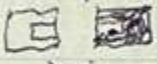
Everybody observes Transparency

1. Transparency a physical, not a perceptual phenomenon

Counterexample a)  b) 

Physical transparency neither a sufficient nor a necessary condition for perceiving transparency

Naive realism was wrong

2.  Transparency

Perception of Transparency depends on a complex stimulation of the Retina. Field- or Gestalt phenomenon

3. A perceptual illusion as a way to study a phenomenon

Study done by my collaborators and myself, varying systematically form and color of the Target in order to discover the necessary conditions of the phenomenon and some of the mathematical laws ruling it

4. But it ~~has to be~~ Research is also an Example of the widening of a special problem offered by a perceptual illusion

a) Why is just this figure illuding us? Why not another one? ~~When~~

b) Research of the necessary conditions

c) Discovery that the necessary conditions are present also in the ~~normal~~ common case, when physical and perceptual transparency coincide.

d) Then the problem has widened. We do not study apparent transparency but just transparency, be it apparent or real.

Apparent rest

Demonstrations 1), 2) 

Perceptual illusion named apparent rest

Possibility of describing the successive steps bringing to the enlargement for the problem because ~~they~~ it needed several years to develop. Let us take the simpler case

(1.) Systematical change of the conditions 3)

[Phenomenon discovered independently by two Psychologists in the early twenties, in the Maxwell disk. Wertheimer, Werner] 4)

a) change of form. Maxwell disk not necessary nor the best form to get the effect

b) number of differently colored surfaces

c) color, texture etc

Only one condition necessary: at least a part of the contour corresponding to the trajectory of a point.

(also with rectilinear trajectory: rails, train)

~~cylinder contour~~ belt ~~moving~~ covered by a cylinder

$\boxed{\text{15 years after}}$ of a railway – poles moving, wires resting

(2.) New point of view: What happens on the retina

Which modification in the proximal stimulation (retina) are caused by the motion of the target?

Demonstration 5 (disappearing of another same modification (increasing on one side of the stimulated region on one side, decreasing on the other side) in the case of real and apparent rest

Apparent rest

A much more striking example where from a ~~[illegible]~~ special problem a wider insight develops is the perceptual effect called apparent rest. If the display reproduced in Fig. 5 is rotated slowly around the center of the semicircle (3)4, what we see is a complete resting disk with a series of circles inside, which is periodically covered and uncovered by a rectangle turning on it. If the display of Fig 6 is rotated slowly around the center of the inside arc, we see a resting circle periodically covered and uncovered by a peripherically located circle rotating on it.

The phenomenon was observed by Wittmann (1920) and by Werner and Wildhagen (1924) on fusing two colors with the Maxwell disk (Fig 7). When the current is interrupted, the rotating disk ~~is slower~~ slows down still resting. When the speed is little, one sees one sector (the minor one) rotating upon a steady disk.

Strange enough, ~~both authors~~ the above authors ~~stucked~~

(3) If the display is reproduced in normal size (radius ~~about~~ about 15 cm) the effect can be observed at home, using a turntable for records

Fig. 5

Fig. 6

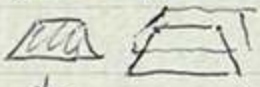
Fig. 7

E The problem seems to have disappeared

(3.) Still a problem. Why do we see in both cases a rectangle turning on a resting circle, and not a ~~turning configuration having the form~~ ?
{ a half circle rotating together with a rectangle ? illusion
At this point the problem does not regard the ~~illusory~~ but ~~also the~~ equally the non-illusory situation

(4.) A more general problem: what happens on the retina when an object is moving in front of a ground

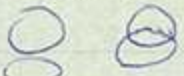
a) (motion of an homogeneously colored figure moving in front of a differently ~~colored~~ homogeneously colored ground)



stimulation increasing on one side and decreasing on the other
increasing - decreasing hom. stimulation regions

But what of the borders (lines corresponding to abrupt change of stimulation): they are wandering

b) Encounter with a resting figure: moving figure moving in front or behind the ~~of~~ resting one: same effect about the region stimulated on the retina (increasing or decreasing) But the borders behave elsewhere in the two cases: borders of resting objects are resting. They just increase or decrease but do not wander.



c) distinction between 2 types of borders, wandering or resting

(5.) Back to our illusion: also 2 types of borders
Border corresponding to the trajectory of a point does not wander: kinetically matter border.

Il caso dell'oggetto con margini
enchiamente divaganti, che si spezza
in due oggetti con margini ognun enchiamente
omogenei è il caso che si verifica nor-
malmente: margini in quiete (enchiamenti
inattivi) e margini in movimento (enchiamenti
attivi) danno luogo non ad una figura
in confronto ma ad un oggetto in movi-
mento e un oggetto in quiete.

So the distinction between borders of moving objects and borders of resting ones ~~seems~~ became important to explain our illusions. But in fact just the contrary happened. The distinction between the two types of borders – functionally active and inactive – has been supported by the illusion – the phenomenon of apparent rest – and then it appeared that the distinction was important also under usual conditions (when the perceptual world gives useful informations about the reality.)

(6.) So it is clear that moving object with functionally inactive borders cannot be distinguished from a resting object.

But what about the case where an object has one part of ~~this~~ his borders functionally active and one part functionally inactive? under favourable conditions – that we have not time to specify here – an object with functionally heterogeneous borders splits into two objects, every one with functionally homogeneous borders, that is one moving and one resting object.

(7.) But let us consider again the general problem. What happens on the retina if an object is moving in a field of irregular and irregularly placed things?

It is generally accepted that physical motion is not acting as a stimulus

According to our description there are regions increasing and decreasing, as well corresponding to resting things as well as to the moving ones. There are jumps of stimulation, that is borders resting and increasing or decreasing, and moving. But because of the tendency towards the kinetic homogeneity of borders – first observed in the case of apparent rest – instead of a caleidoscopic change of increasing and decreasing objects or surfaces ~~we perceive~~ kinetic active borders unify together and we see just one object moving among a series of resting objects.

So, starting from the analysis of a perceptual illusion we get to a contribution to the optical theory of motion.

The perception of a hole

What do you see? Please ~~come~~ go nearer. Please touch with your index the square at the left.

1. Contrary of the Gestalt phenomenon

2. Variation of conditions. making more or less evident

Possible to vary the frequency by varying some conditions (width of the frame, size of the opening etc) but the only real necessary condition is the homogeneity of the color of the region behind the hole

Stimulation of the surface at the back abolishes the phenomenon.

3. Explanation

Koffka's one-sided action of the borders. If there are not conditions acting against, the borders are part of the inside and not of the outside region and give rise to a figure on a ground. However the figure-ground phenomenon is all but explained. The above illusion can ~~[illegible]~~ bring some new ideas.

4. Considered from the point of view of proximal stimulation the problem again vanishes: the stimulation is equal ~~if there is~~ whether there is a hole with an homogeneous surface on the back, or if there is a white homogeneous piece of paper attached on a differently colored surface. But when the surface on the back of the hole is figured, the stimulation is different

in the two above cases: in the case of the hole the images on the two eyes differs, while it is the same in the case of an attached figure paper.

I have to admit that we are not yet ready to make the third step, showing the contribution of the illusion to a more general problem of space perception. We only hope that it will not take us 75 years, as in the case of the apparent rest.

But although I cannot give a demonstration of it, it is perhaps interesting to say that one of my students, a young girl, Claverdon has been able to obtain the opposite effect, discovering some conditions giving rise to the perception of a hole, where no hole exists.

For: if the brightness of two bordering surfaces are very similar

if the color of the surface behind a hole is deep black, we always perceive a hole.

grafici t

t = 9,36 M (bianco) leggera pendenza verso il grigio
con l'aumentare di α
fondo nero, riferendosi a △□

t = 4,86 (nero fine) ~~forte~~ pendenza verso il bianco
bianco dietro a t
fondo chiaro, pendenza più forte, inizio più basso
fine più in alto

t = 0,53 (nero) forte pendenza verso il bianco
inizio molto più alto di t
fondo chiaro inizio e fine più alti, pendenza
maggiore

□ alfa?

△ e □ uguali o paralleli

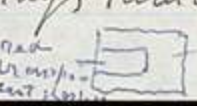
Apparent Transparency

~~of a perceptual illusion is apparent transparency~~

My first example is transparency. Of course studying the perception of transparency we have to answer a natural objection.* Transparency is not a perceptual but a physical problem: we perceive transparency when a physical object is permeable to the light. Therefore we have to begin showing that physical transparency is neither a ~~necessary~~ nor a sufficient condition for perceiving transparency. (1) The display represented in Fig. 2 ~~This display~~ is generally perceived as transparent. But there is nothing physically transparent there. It is just a mosaic of opaque pieces of cardboard of different color. So, physical transparency is not a necessary condition for perceiving transparency, or in other words, there are cases of apparent transparency. ~~But~~ On the contrary, nobody perceives transparency in ~~this other~~ display (2) of Fig. 3 while the red plate which is glued upon the white cardboard is physically transparent. (3) ~~The color can be changed without changing the effect~~ (4) And this proves that physical transparency is not a sufficient condition to perceive transparency.

But thinking of the stimulation originating the perception of transparency it is clear that the visual system does not receive any information about the conditions giving rise to it, if the light rays stimulating the retina ~~went through~~

F.g. 2



F.g. 3

(2) The colors can be varied without any effect on the phenomenon

passed or not through a transparent medium. or not

How do we study perceptual transparency? As every other perceptual phenomenon, changing ~~systhematic~~ the conditions systematically, ~~in par~~ especially the colors and the forms of the surfaces giving rise to it. Following this way my collaborators and I have been able to formulate mathematically the necessary conditions of the perception of transparency.

But here ~~We~~ I have to confine myself to a little demonstration, which is in a way typical as it shows an important aspect of the phenomenon. Putting ~~the~~ two displays together in such a way that there is continuity between the borders of the ~~red~~ plastics, transparency is perceived. We are forced to draw the conclusion that transparency depends on a complex stimulation of the visual organ. It is what we call a Gestalt phenomenon; or in other words it does not depend on local stimulation, which did not change.

But the ~~more important~~ conclusion of our demonstrations ~~Thesis~~ is that the necessary conditions of perceptual transparency, although studied starting from cases of apparent transparency, are valid also in the more common case, when physical and perceptual transparency coincide. The problem has widened: it is not more the problem of the conditions of apparent transparency, but the general problem of the perception of transparency without restriction.

 Fig. 3a  Fig. 4

did not change systematically the form of the display but stuck to the Maxwell disk. Wittmann[14] tried to give an explanation of the phenomenon, asserting that when the subject concentrates on the motion of the minor sector, the major one closes in a circle. An explanation which is evidently wrong, because as more the subject concentrates its attention on the apparently resting circle, as greater the evidence of the phenomenon.[5] 6

Changing systematically the shape of the display I discovered immediately that the Maxwell disk was the worst display for demonstrating the phenomenon, and that the only necessary condition was that at least one part of the contour corresponds to the trajectory of a point. It is therefore perhaps opportune to stress that the phenomenon is not limited to the rotatory motion but can be obtained with translatory motion as well.

6

(5) This shift of attention succeeds easier with displays of Fig 5 or 6.

(14) I was not able to retrace, either asking Professor Werner himself or at Hamburg University, W. and W.'s paper

~~13~~ ~~121~~

The second example of ~~a perceptual illusion~~ a special problem widening into a general one is an illusion I called apparent rest. 1) 2)

As you see, in both examples you have the coercitive impression that a resting circle is successively visible in all its parts, being successively covered and uncovered by another figure (a rectangle in one case and a circle in the second) turning upon it.

I thought to have discovered it, but it had been discovered before, by Wittmann in 1920 and rediscovered later by Werner and in

In fact it is very easy to observe it when a Maxwell disk is beginning to rotate, or is ~~slowing down~~ rotating slower and slower when the current has been taken off to stop it. The disk being made of two differently colored sectors, when it turns slowly, ~~at a~~ not at a fusion speed, one of the sectors, generally the smaller one, is perceived as turning upon a steady disk.

The explanation of the discoverer was based on attention: while you attend to one of the sectors, the other shuts in a circle. Not a very satisfactory explanation, and however a wrong one. As everybody will easily remember, it is on the steady disk and not on the moving figure that attention is ~~more~~ naturally concentrated; and however, concentrating the attention

A typical example of apparent rest with translatory motion is obtained with apparatus of Fig. 8 while the reverse of the phenomenon is what we observe traveling with a train when we see the telegraph poles moving while the rails are resting

Fig. 8

2. ~~A few years after it happened to me to see the problem~~ But the problem can be seen from another angle, that is from the point of view of the retinal stimulation

on the steady disk, the phenomenon does not generally change. And, strange enough, both researchers stuck to the Maxwell disk, which does not offer the best conditions to study the phenomenon.

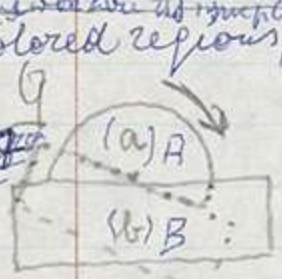
I changed systematically all conditions: first of all the form of the turning object, the form of its parts, the number of differently colored parts, the colors, the texture, and found that there was only one necessary condition of the phenomenon: at least the contour of a part of the rotating surface has to correspond to the trajectory of a point. This part is perceived as steady, and the other parts are seen as moving upon it. (If that part is textured, the texture is perceived as moving upon a steady surface). The above statement explains why the Maxwell disk gives the impression of unsteadiness: there is a conflict between the two sectors, each ~~afoo~~ having the contour corresponding to the trajectory of a point and tending to be perceived at rest: a conflicting situation. It also shows that the phenomenon is not confined to a rotating object: the same effect can be observed with translation, and is often observed through the window of a moving train, where things apparently move, and poles appear to move upon resting wires.

(2) But has been the phenomenon explained through finding its necessary condition?

I was never satisfied, not having the impression that I had reached what I was looking for. But only after several years it became clear to me that I had studied the conditions on the target. But this was only a first step: what I had to study were the effects of the modifications of the target on the proximal stimulation, namely that is the retinal projection.

Then the new question is "Which modifications on the proximal stimulation are caused by the motion of the target?" Let us try to give a very raw description of it.

It is easy to see that when the target, made of two differently colored regions, rotates, the region stimulated by stimulus a decreases from one side and increases from the other, and the contrary happens to the region stimulated by the b stimulus. The result is, that we are perceiving the B region turning upon a steady complete circle.



But what happens on the proximal stimulation if we imitate with the target what we were perceiving, that is if we use as a target a steady circle upon which a rectangle is turning? Then we see, to our surprise that what happens on the retinal projection is exactly the same: the A region is increasing on one side and decreasing on the other, and the contrary happens to the B re

(6) We confine ourselves to take into consideration Fig. 5, for the sake of simplicity

g. on. Therefore, as the stimulation is the same in both cases, the perception ~~has to be~~ is necessarily the same. The explanation is very simple and there is no more problem. Our problem ~~has simply~~ seems to have disappeared.

3. However, a more thorough analysis shows that not everything has been explained. Because, while it is clear that, the stimulation being the same, the perception has to be the same, it is by no means clear why we perceive in both cases a figure rotating on a resting one, and not the whole configuration rotating. In other words, why do we see in both cases a rectangle ~~rotating~~ ~~turn~~ turning on a resting complete circle and not a half circle rotating together with a rectangle?

It is interesting to point out that the problem has widened: it no more regards the illusion only, but the non-illusory situation also.

4. Then we are faced with a more general problem: what happens on the retina when an object is moving upon a ground?

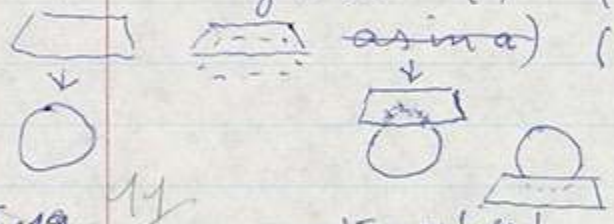
a) To study a typical example, let us simplify the case considering an homogeneously colored figure moving in front of a differently homogeneously colored ground. (Fig. 8)

Fig. 8

The result — on the proximal stimulation — is that (corresponding to the figure) an homogeneously stimulated region ~~has an area~~ is increasing ~~may~~ on one side and decreasing on the other; while the contrary is happening to the ~~another~~ homogeneously stimu-

(corresponding to) 15 Then ~~we assert that~~ ~~12/5~~
lated region (the ground). ~~As a conclusion~~, there are two homogeneously stimulated regions that are increasing on one side and decreasing on the other but - they are both non moving. So there seems to be no motion at all on the retina. But there is something - the border between the two regions, that is the abrupt jump of stimulation between one region and the other, which is wandering.

b) Now let us consider the encounter of the moving ~~figure~~ figure with another (still differently colored but homogeneous) figure, which is resting. We are interested in two different possibilities: either (1) the moving figure is passing ~~in front of~~ behind the resting figure or (2) ~~behind~~ in front of it. ~~There is a similarity between (1) and (2)~~ (1) ~~The moving figure is~~,



~~as in a)~~ (1) At the moment of the encounter the stimulation corresponding to the moving object ~~goes on increasing~~ decreases ~~by~~

Fig 10 14

on one ~~side~~ and after a while ~~decreases~~ increases on the other side, ~~but this time~~ on the expense of the ~~resting figure~~ ground. But (2) as it passes ~~behind~~ in front of the figure it ~~begins to still~~ decreases on the same side, but this time at the profit of the stimulation corresponding to the moving figure, while after a time on the other side it is growing at the expense of the stimulation corresponding to the ground.

~~The opposite is happening if the moving object is passing behind the resting figure.~~ While in the first

case (1) ~~It was~~ the ~~resting~~ moving figure was shrinking (because it was decreasing on one side while remaining unchanged on the other side) till sometimes disappearing and then widening; in the second case (2) that is when the figure was moving ~~behind~~ in front of the resting figure, it is the ~~moving~~ resting figure that shrinks at the beginning, then sometimes disappears and then widens till regaining her prior size and form.

~~However there are increasing and decreasing homogeneously stimulated regions, not motion. But what about the borders?~~ The moving as well as the resting ~~5. What is clear in our~~ figure are both giving rise to ~~widening and~~ increasing and decreasing homogeneously stimulated regions, not to motion. But what about the borders? We see that there are borders between homogeneously stimulated regions that are resting and borders that are shifting. The borders of the retinal projection of the steady figure are steady while the borders of the moving figure are shifting.

5. Now let us go back to our illusion. What happens of the borders of the retinal projection of the apparently resting figure as part of our configuration? They are increasing on one side and decreasing on the other (as the borders of the retinal projection of the steady figure do, when it is covered or uncovered by the moving figure), but they are resting as the borders of the steady figure do.

So we are faced with two types of borders, the ~~the~~ shifting borders of the retinal projection of the moving figure, which we shall call Kinetically active borders and the resting borders of the projection of the steady figure as well as those of the ~~apparently resting part~~ projection of the apparently resting figure of the illusory configuration, which we shall call Kinetically non-active borders.

But let us see what happens when a configuration (an object, like our target) has some of the borders which are Kinetically active, and some Kinetically inactive, that is, it has Kinetically inhomogeneous borders. What happens in this case is our illusory result: ~~a~~ the configuration splits in two objects, each of them with Kinetically homogeneous borders.

But this case is all but exceptional. Every time when ~~the~~ a moving figure is passing in front or at the back of a resting figure, a similar situation arises at the retinal projection's level. When an object moves in front or behind another object, giving rise to a configuration with Kinetically inhomogeneous borders. ~~But~~ Through the tendency towards ~~homogeneosly~~ Kinetically homogeneous borders a moving figure wandering in front or behind a resting one is seen.

So, when an object is moving in a field of resting objects, instead of a colidoscopic change of widening and shrinking figures, ~~the not~~, ~~towards~~ through the tendency to

Kinetically homogeneous borders, the real thing is perceived.

We only need a cardboard with a hole in its central region, through which we see a part of ~~an~~ an homogeneous region of different color.

but as a figure, pasted on the cardboard, having as borders

8

(7) Often this simple demonstration does not succeed because the surface behind the hole is not really homogeneous (if it is a wall, there are shadows on it. But Prof. Da Pos constructed a simple gadget, which makes coercive for every subject the disappearance of the hole

The disappearance of a hole

The third example of ~~an illusion, whose study interest~~ a problem regarding an illusion, whose study appears to be interesting above the ~~mere~~ mere illusion, is the problem of the perception of a hole.

The illusion is simply demonstrated, without any apparatus. ~~also~~ We only need a cardboard with a hole in its central region. ~~Demonstration~~ through which we look towards an homogeneous surface (for example the wall). ~~It shows that~~ The hole, if the surface behind it is homogeneous, is not perceived as a hole, ~~but~~ but as a ~~surface~~ figure painted on the cardboard and having as borders, the borders of the hole. Varying ~~all~~ every condition (form, size, color) to obtain the illusion (X) NOTA the ~~study~~ only necessary one appeared to be the homogeneity of the surface visible through the hole.

But we already learned the lesson that what really matters is not what happens on the target, but the stimulus conditions at the retinal level. Here we see that ~~while~~ there is a difference between the stimulation produced by a piece of paper of different color attached on a screen and a hole in the screen ~~only~~ if the bottom of the hole ~~is~~ is inhomogeneous; but there is no difference if the hole is homogeneous, because in this case there is nothing that could give rise to retinal disparity, ~~that is~~ or to differential focussing, that is to depth perception. Again the problem seems to have disappeared.

But ~~at~~ there is a ~~problem~~ problem unsolved in this

(X) we saw that although there are conditions favouring or hindering the phenomenon — D'Cardon made a quantitative study of it — it resulted that (7) v. retro pagina precedente 8 ALTRA PAGINA

case also: why do we see, in both cases, a paper attached on the surface and not a hole? The question seems to be solved by the one-sided functioning of the border, the border being perceived as a part of the included ~~region~~ and not of the including region of the field – a discovery due to Rubin and Koffka. But again, why is the border functioning this way? And than, a strange exception. If the insides of the hole is black, notwithstanding its perfect homogeneity it is perceived as a hole.

So, there are still several unanswered questions. The research in this field has been carried on by Professor DaPos and by Dr Cameron, Professor DaPos having discovered a very interesting effect of apparent fog, and Dr Cameron having been able to obtain the opposite effect, putting on light some special conditions giving rise to the perception of a hole, when no hole exists.

At present, research on this subject is at rest. But it is just apparent rest.

Fig. 11.12

Summary The function of perceptual illusions in research is discussed and demonstrated analyzing three perceptual illusions observed and studied by the Author: the apparent transparency, the apparent rest and the disappearing of a hole.

Fabio Metelli

Su alcune ~~Alcune osservazioni sulle~~ condizioni spazio-figurali della trasparenza. *

Stabilita la ripetibilità del realizzarsi della percezione della trasparenza da condizioni cromatiche e figurali (Kanizsa 1956, Metelli 1962) i meccanismi di condizioni sono stati studiati separatamente. Le condizioni figurali sono state riprese in esame da Metelli (1975, 1981) e Kanizsa (1982) indipendentemente. Nella presente nota, che non ha nessuna pretesa di sistematicità, ci proponiamo di mettere in evidenza ed eventualmente tentare di chiarire alcuni punti che sembrano presentare un certo interesse.

Premessa

Numero delle regioni interessate al fenomeno della trasparenza

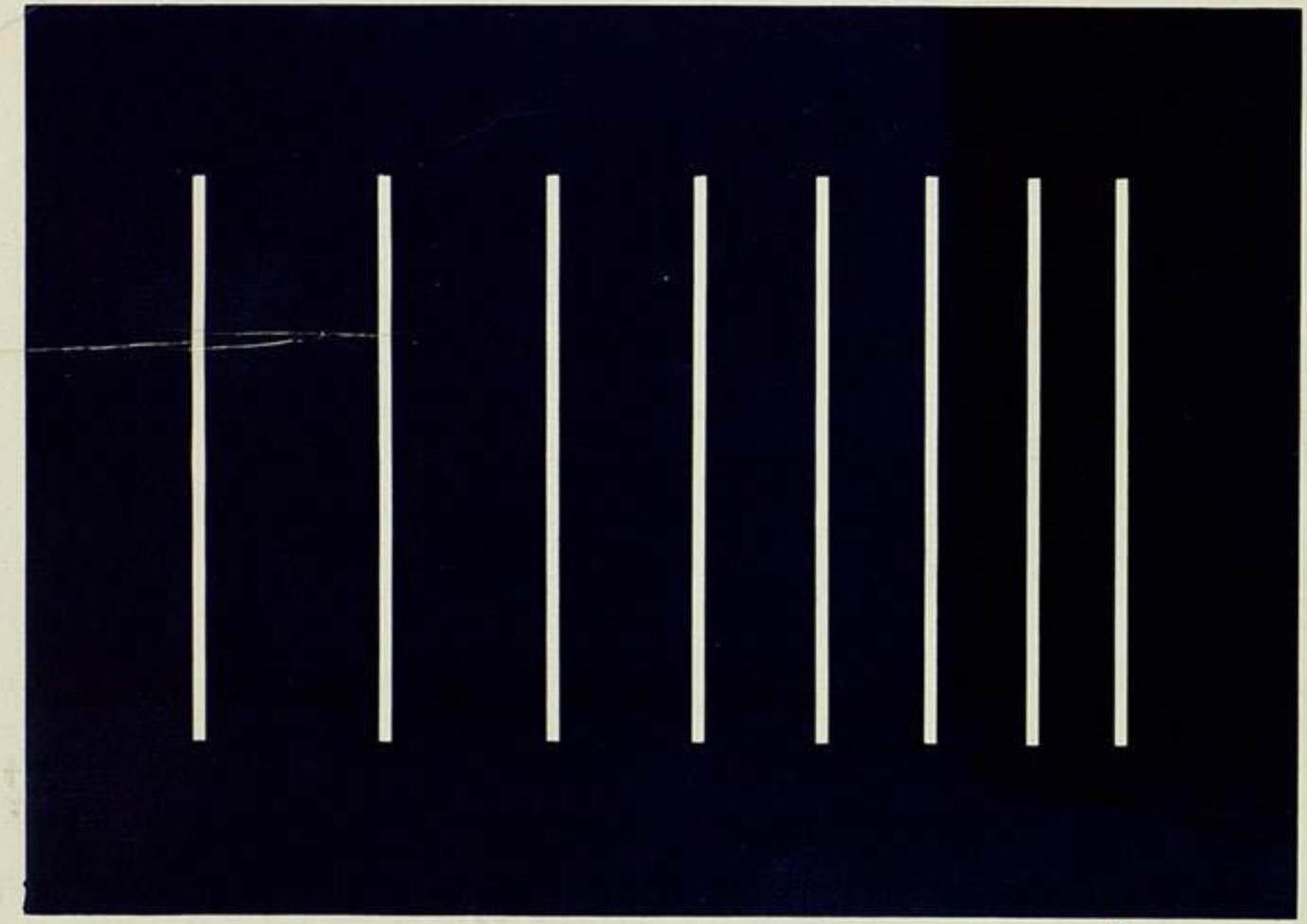
a) Trasparenza implicante un minimo di 2 regioni differenziate nel campo visivo

a1) Ombre trasparenti

quando un'ombra "portata" cade su uno sfondo omogeneo, si hanno due regioni di diversa chiarezza, l'ombra, e la superficie che in

---

* Mi è gradito ricordare che il mio interesse per la Percezione della trasparenza ha avuto origine dalla lettura dell'articolo pubblicato nel 1956 da Kanizsa, al quale dedico affettuosamente questa nota. Quell'articolo è una piccola miniera che contiene ancora dei giacimenti inesplorati, o almeno non esplorati a fondo.



a b

Fig. 2

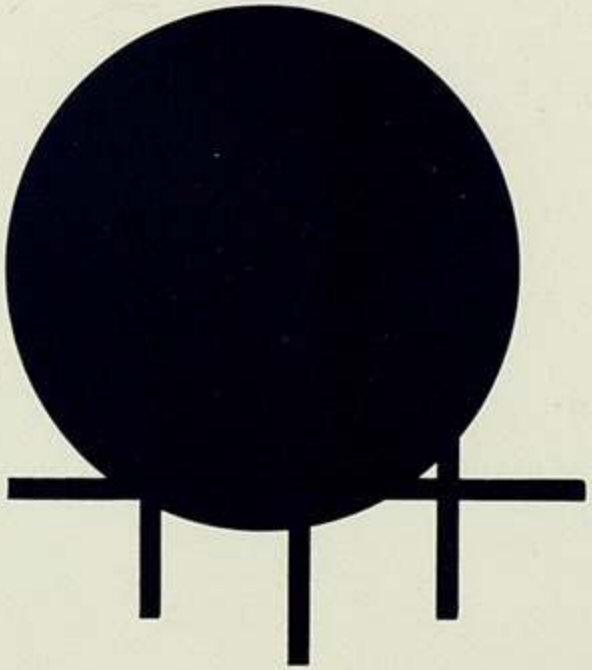
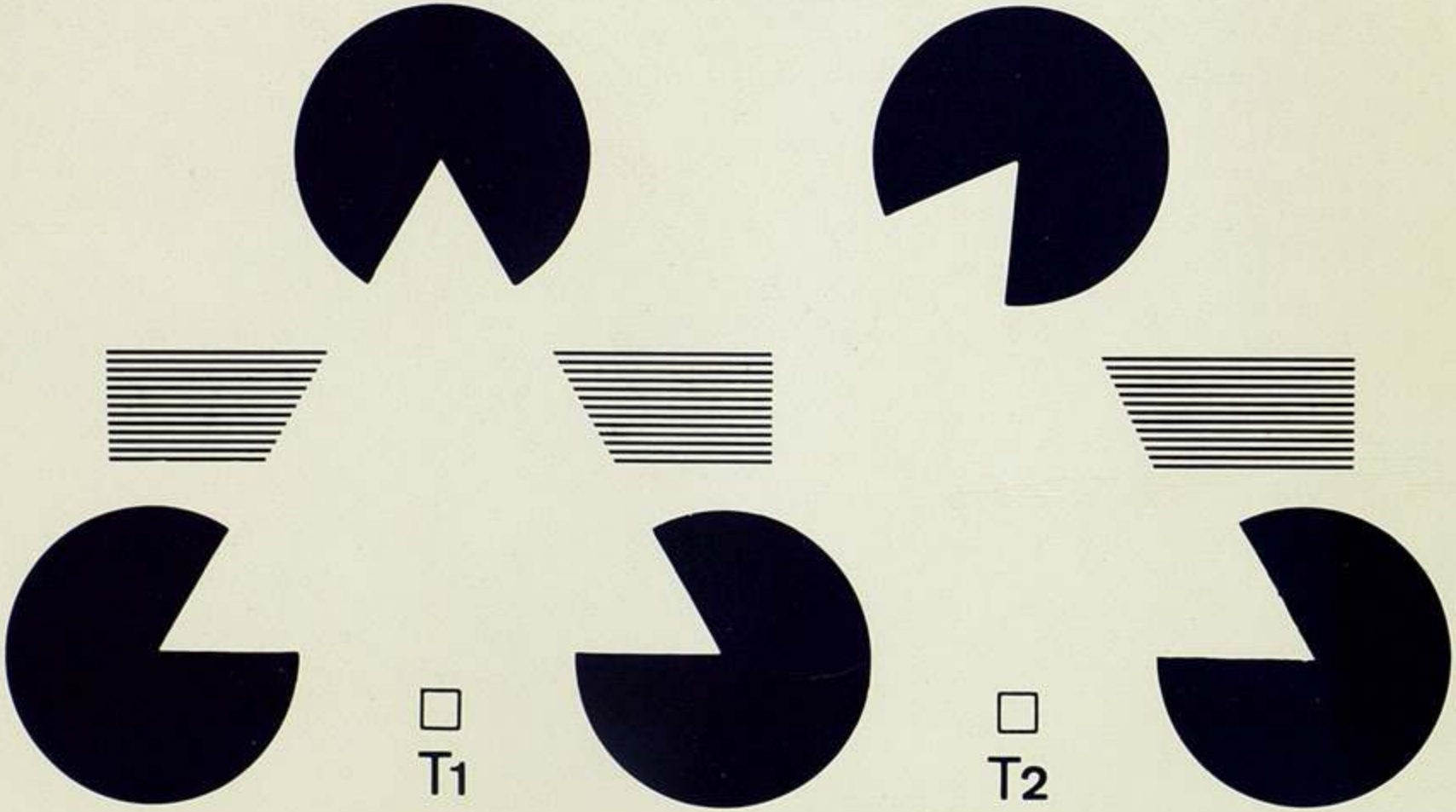
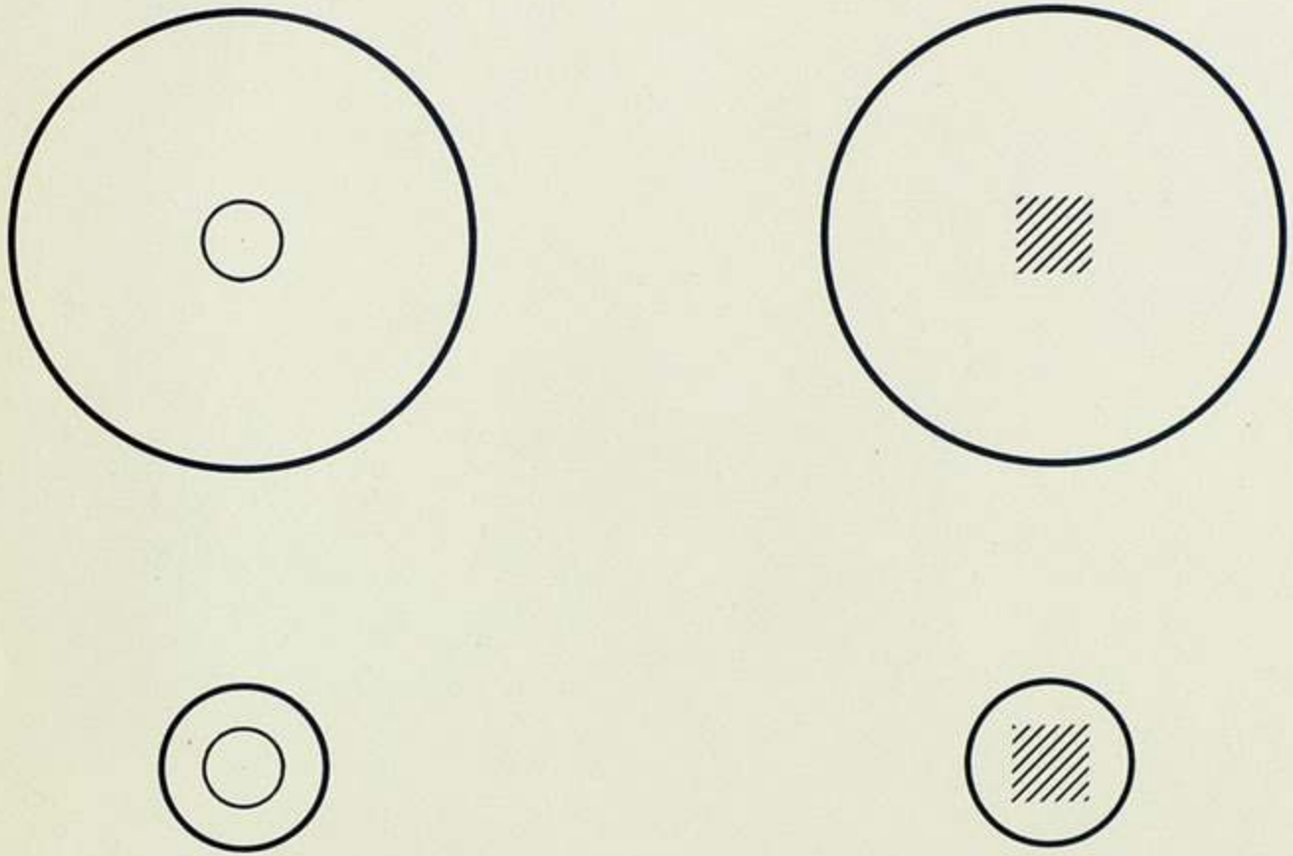


Fig. 1


T1
T2



A B

fig. 17

Fabio Metelli

The function of the perceptual illusions in research

Having to speak about perceptual illusions, it seems well to begin with a definiction. We speak of an illusion when the attributes of a perceived configuration differ from the corresponding characteristics of the target.

Let us give an example: the paper with the drawing is the target, and the a and b segments are equal as I draw them egual; but in the perceptual configuration they are unegual.

There are two ways of considering perceptual illusions. The more common one is to consider them exceptions, where our perceptual apparatus did not function well, and therefore it did not give us, as it always does, ~~trustworthy~~ ~~truthful~~ veridical information about the real world.

The other way is considering them as alarm signals, breaks in the cuirass of our naive realism, through which the difference between perceptual and real world becomes directly visible.

There is a natural tendency towards naive realism, that is to ignore the above difference and to think that what we see is the real world.

There are several ways to preserve our realism.

So f. ex. when in a car accident the driver says that he did not see the person crossing the way. What is meant in this statement is that he did not direct his look or his atten-

tion to the person: in other words, his perceptual apparatus did function well, only it had not been used the right way.

Perceptual illusions are important, because with perceptual illusions this type of explanation does not function.

Let us take the famous example of the Ganzfeld. There is a very big homogeneous wall in front of me and I see fog. No change of attention and of gaze direction helps. We have to explain why we do not see the wall, although it is in front of us.

We begin with looking for the solution of a special phenomenon. But soon or late our scope widens. The problem becomes more general. Why do whe see a wall when there is a wall? Why do we see the color condensed on a surface, and empty transparent space before it?

In other words not only the illusory perception but also the truthful one puts a problem.

This is the thesis I intend to illustrate with some examples: the function of perceptual illusions is to show us that the perceptual world is a set of problems to be discovered first and then to be studied and solved. My examples should show how, studying illusions, from a limited special problem a wider insight develops.

a) Transparency

My first example is transparency. First of all I have to

meet ~~the~~ a natural objection, that the conditions for perceiving transparency are physical, that transparency is a physical and not a perceptual phenomenon. Than let us do a little experiment. (I) Do you see something transparent here?

Well, there is nothing physically transparent here, only a mosaic of opaque pieces of cardboard. And here? (II) Certainly not. But in fact the red plastic is physically transparent (III) ~~So, I reached two results. First of all~~ So I showed that physical transparency is neither a necessary nor a sufficient condition for perceiving transparency. Obviously because the visual system does not receive any information whether the light rays stimulating the retina are paesing through a transparent layer or not. Second, therefore we can study the perception of transparency either whith ~~apparent or~~ apparently but not really transparent targets or in conditions of physical transparency, at will.

Then, what gives rise to the impression of transparency? Let us do a little demonstration (IV) Now you see transparency where there was not. This experiment shows that transparency depends on a complex stimulation, as local stimulation remained the same ~~did not change~~.

Having reached the proof that there is no link between physical and perceptual transparency, it is justified to study the perception of transparency either under conditions of physical transparency, or under conditions of apparent transparency In other words, the phenomenon being studied

target, display

does not regard just an illusion, but a ~~thrustworthy~~ truthful perception as well. According to the opportunity (that is, according to the conditions having to be studied) the illusory perception or the ~~thrustworthy~~ truthful perception can be used ~~as a display~~ for research. And so we did, studying the spatial and the chromatic conditions of the perception of transparency.

b) Apparent rest

There is a typical example of a special problem widening into a general one: the phenomenon I called apparent rest.

(V) (VI) No time to do the experiment properly. People have ~~in general~~ that is a coercive impression of a resting circle successively visible in all of its parts, while in fact, the whole configuration is rotating.

a) I met this type of phenomenon as others did, working with a Maxwell disk; the first step of my study was looking for the necessary conditions. Through systematic variation I found that there was only one necessary condition: one part of the border has to correspond to the trajectory of a point. (The illusion can be obtained with rectilinear motion also).

b) ~~After years, having the impression not having~~ In order to find an explanation ~~of that~~ I had not explained the phenomenon, I ~~got to~~ put a new question "which modifications on the proximal stimulation (retina) are caused by the motion of ~~one of~~ the above target~~s~~!" Let us take a simple target and ~~Let us~~ consider a symplified drawing (VII) Through rotation the retinal region stimulated by the a stimulus is decreasing

But with the search of the necessary conditions only the first step of the research has been done.

In order to find an explanation of the phenomenon it is opportune to consider what happens at the level of the sense organ.

Let us consider a simpler case. What happens at the retinal pro= jection level when a homogeneously colored figure is moving on a homogeneous, but differently colored ground. There is a homogeneously stimulated region, which is shrinking on one side, and widening on the other side. Of course, the stimulation originated from the ground widens and shrinks in the opposite way.

The same happens with our display: as it is turning, the stimulation originating from the semicircle decreases on one side and increases on the other, and the opposite happens of the stimulation originating from the rectangle.

But what happens if instead of using the illusory display, we use a rectangle rotating on a stady circle? It is easy to see that the stimu= lation is the same in both cases. And if the stimulation is the same, the perception is obviously the same. But there is still a problem: why do we see, in both cases, a stady circle and a rotating rectangle? Why not the whole configuration rotating?

From the preceding analysis it was clear that on the re= tinal level there is not motion but only increasing and decreasing of ho= mogeneously stimulated regions. But the borders, that is the lines of abrupt change between differently stimulated regions, behave differently: they are resting or shifting; So for example, the border of the circle is re= sting - although it decreases on one side and increases on the other - while the border of the rectangle is shifting. We shall call the last ones kinetically active borders (because shifting borders give rise to the per= ception of motion) and the resting ones, kinetically non active.

What about our display? The part of the border corresponding to the trajectory of a point, the semicirular one, is kinetically non active, and the remaining one is kinetically active. The border of the display is kinetically inhomogeneous. And as a result the configuration splits in two figures, the circle and the rectangle, each with kinetically homogeneous borders.

The tendency towards kinetically homogeneous borders, which was hypotyzed here, is commonly acting inour visual world. ~~When a figure is moving in front of a steady one,~~

border of the resting figure is increasing and decreasing but not shifting.

d) Now let us go back to our illusory figure. What happens of the borders of the apparently resting part of the configuration? They are increasing and decreasing, but resting, as the borders of the resting figure do. Then, in the special case of our figure, as in the general case of moving and resting objects, we have two types of borders, wich we shall call kinetically active and kinetically not active: the firstones only are giving rise to the perception of a moving figure.

Our configuration gives rise to a retinal projection with both type of borders: in other words its borders are kinetically non homogeneous. And what happens: the configuration splits ~~shifts~~ into two figures, each with kinetically homogeneous borders. The tendency through kinetically homogeneous borders is all but exceptionally acting. Every time when a moving figure is passing in front of a resting one, a similar situation is arising at the retinal projection level: we are faced with a configuration with kinetically inhomogeneous borders. And instead of a calendoscopic widening and shrinking of figures, through the tendency towards kinetical homogeneity of borders, a figure moving in front of a resting figure is perceived.

c) The disappearing hole

Demonstration: what do you see. Touch the rectangles beginning with the right one. (Demonstration without apparatus).

We begun to study the phenomenon as always, with varying conditions systematically; the only necessary condition resulted to be the homogeneity of the surface behind the hole.

Than, as usual, wa considered the proximal stimulation, and it appeared that there was a difference between a piece of paper pasted on a cardboard, and a hole, only if the insides of the hole was inhomogeneous. In this case the difference was caused by retinal disparity (i.e. the location of the background of the hole on a different plane) and difference in focusing. Otherwise there was no difference, and also in this case the problem seemed to disappear.

But there is still a question to be asked. Why do we see a paper pasted on a cardboard and not a hole? There is a well known quality of the border, the one-sided function of the border, that normally outlines only insides and not outsides. But why the border is acting this way, is still an open question. And then a strange exception still unexplained: if the insides of the hole is black, not withslanding its homogeneity, it is perceived as a hole.

Research on this field has been carried on by professor Da Pos, who discovered a strange log phenomenon and by dr. Cavedon who has been able to obtain the opposite phenomenon, the perception of a non existing hole.

ZWINGEND Schlüsse ziehen

Notwendige - ausreichende Bedingung

der Effekt der Realismus der Apparat

Durchbruch

geradlinige Bewegung

das Phänomen das Beispiel

der Kreis

das Rechteck

das Loch

gewalt

Forschung Ruhm schmeichelhaft verdienen

Vortrag

Pflichten reichen einladen verehren

Bewunderung Annäherung

komisch

I spoke about this topic several times, mainly abroad (USA, India, Austria), but always with demonstrations ~~which~~ arising raised some interest.

Some ~~such~~ friends expressed the opinion that I should publish my talk. I have yielded to their encouragement although such a paper has the big handicap of the lack of demonstrations which were, I think, the more attractive part of my talk. I remember with amusement that I was forced for necessary reasons of a very dense program, to compress talk and demonstrations in a 10 minutes time at the last Interdisciplinary Conference on Perception at Castelvecchio Pascoli, near Pisa. I succeeded but I don't know how.

THE FUNCTION OF PERCEPTUAL ILLUSIONS IN RESEARCH ✱

by
Fabio Metelli
University of Padova (Italy) Dept of Psychology

As the subject of this paper are perceptual illusions, it is perhaps useful to begin with a definition. According to Professor Rausch it is a case to speak of a perceptual illusion when the attributes of a perceived configuration differ from the corresponding characteristics of the target.

I give an example from the well known geometric optical illusions (Muller-Lyer, Fig.1) in order to clarify the meaning of the concepts of target and perceptual configuration. (1) But the demonstrations described and discussed in this ~~describations discrepancy in was~~ paper will not concern the geometric-optical illusions.

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FIGURE 1

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At this point it this quite natural to ask the following question. Why have the perceptual illusions an important place in ~~almost every handbook of~~ Psychology? Are not illusions unimportant little problems which ~~only a pedant can choose as object of research~~?

Such a radical point of view was represented by James Gibson ~~a dear friend of mine who died years ago~~. We discussed several times this topic, the last time some months before his end.

At my opinion there is a special reason to stress the importance of perceptual illusions. I shall begin with stating briefly my theoretical standpoint. However the main part of this paper will consist in demonstrating and discussing some phenomena which will serve to illustrate the theory.

At the beginning of experimental research in Psychology, but not only at the beginning, but often also nowdays, the illusions were considered as exceptions, where our sensory apparatus did not function well, and therefore did not give, as it always do, true and trustworthy information about the real world. They were studied and are still studied as interesting special problems.

A point of view that never has been completely put aside is that the sensory apparatus cannot lie, and therefore higher functions have been looked for, interfering with sensory data and being the origins of perceptual illusions.

It is however possible to consister perceptual illusions in a quite different way. According to this point of view they are considered alarm signals, breaks in the cuirass of our maive realism, through which the difference between perceptual and real becomes directly visible.

The very function of perceptual illusions is to force us to see a problem where before there seemed to be no problem at all.

It has been always very interesting for me to ascertain that not only the layman, the ordinary man, but also the specialist who founded all his research on the difference between

perceptual and real, falls back in his common life and behavior, to maive realism in an absolutely natural way. What he ~~needs~~ sees is a car and not a ~~maculat~~ moment he is thinking that it is the percept~~ion~~ual image of a car.

It is necessary, in order to live a normal life, to ignore or at least to disgregard the difference between perceptual world and reality (behavioral and geographical environment, according to Koffka's original concepts). (2)

We have a typical way to defend ourselves and to preserve our realism. If we stumble in a step we simply say that we did not see or did not notice it. And in the same way we do often explain the tragis happening of a car accident: we did not see the person. It is clear that, according to the previous ~~instruction~~ distinction between behavioral (or perceptual) and geographical (or real) environment, the step, or the person did not exist in our perceptual world. But with our explanation we are meaning that we should have been able to see the object under~~estimation~~ discussion, if we had only changed the direction of our look, or if we had changed the concentration of our attention. What we mean is that the perceptual apparatus was functioning exactly but we did not use it in the right way.

But ~~they~~ there are cases, and these are just the perceptual illusions, where this explanation does not ~~old~~ hold. In these cases, direction of look and attention ~~we~~ do not help to perceive what really is there.

Let us take as an example the famous Ganzfeld experiment ~~of~~ discovered by

Wertheimer ~~and~~ studied by Metzger. There is a wall in front of us, and we see just fog. In this case there is no way to escape the problem, to make disappear the phenomenon. Change in attention or in directing the look does not change what we are seeing. This type of phenomena generates a crisis of our naive realism.

We have to explain why we do not see the wall, although it is a front of us. Our first attitude in these cases is to look for a solution of the illusion as a special limited phenomenon. What we ask is: why did not our peripheral apparatus regularly function in this special case although as a rule it gives us a true reproduction of reality?

This is the natural way to follow, at first, for every perceptual illusion. It is like we behave if in an old building: a piece of plaster falls from a wall and we get it repaired so that the color is almost eterogeneous and for the superficial ovewer there is no fault to see. The same can happen a secord, a third time. But sooner or later the whole plaster falls, and with big amazement and happiness we discover that a fresco was hidden under the plaster.

~~Something similar happens, soomer or later, when a perceptual illusion in studied.~~

Let us go back to the Ganzfeld-Phenomenon. The first, and more natural question is "Why don"t we see the wall? But suddenly - after a more or less long delay - we discover that this is only a partial problem. Then we ask ourselves not only under which conditions we see fog instead of a wall, but also

under which conditions do we see a wall, when a wall is really in front of us. Why do we see, in this case, the color condensed on a surface in front of us, and before it a colorless transparent space? And why does the problem concern only the wall? under which condition do we see a chair, a desk, a book when these objects are being in front of us?

In this sense the perceptual illusions are precious signals forcing us or aiding us to acknowledge a problem where there seemed to be no problem and every thing appeared ~~so~~ to be obvious. In this sense the perceptual illusions took an important part to the birth of the modern perception psychology and convinced us perception psychologists (I think at least the majority of us) that the perceptual world - the only world with which we have direct contact - is all a set of problems, which have to be discovered - and this is often the most serious difficulty - before trying to solve them.

With this assertion I am ending the first part of my paper. Now I'll ll try to show - using as examples some perceptual illusions which have been observed and studid by my collaborators and me, the development of the problems according to what I said before, that is to show ~~hers~~ how from a limited special problem a wider insight develops.

APPARENT TRANSPARENCY

Apparent Transparency

My first example of a perceptual illusion is apparent transparency. Of course, studying the perception of transparency we have to answer a natural objection. Transparency is not a perceptual but a physical problem, we perceive transparency when a physical object is permeable to the light. Therefore we have to begin showing that physical transparency is neither a necessary nor a sufficient condition for perceiving transparency.

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FIGURE 2

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The display represented in Fig. 2 is generally perceived as transparent. But there is nothing physically transparent there. It is just a mosaic of opaque pieces of cardboard of different color. So, physical transparency is not a necessary condition for perceiving transparency, or in other words, there are cases of apparent transparency. On the contrary, nobody perceives transparency in the display of Fig. 3, While the red plastic which is glued upon a white cardboard is physically transparent.(3) And this proovs that physical transparency is not a sufficient conditione to perceive transparency.

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FIGURE 3

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But thinking of the stimulation originating the perception of transparency it is clear that the visual system does not receive any information about the conditions giving rise to ~~it,~~ transparency, namely if the light rays stimulating the retina passed or not through a transparent medium.

How do we study perceptual transparency? As every other perceptual phenomenon, changing the conditions systematically, especially the colors and the forms of the surfaces giving rise to it. Following this way ~~my collaborators and I~~ we have been able to formulate mathematically ~~the necessary~~ some conditions of the perception of transparency.

But here I have to confine myself to a little demonstration, which is in a way typical as it shows an important aspect of the phenomenon. Putting the two displays 3 and 3a together in such way that there is continuity between the borders of the plastics, transparency is perceived. We are forced to draw the conclusion that transparency depends on a complex stimulation of the visual organ. It is what we call a gestalt phenomenon, or in other words it does not depend on local stimulation, which in our example did not change.

But the conclusion of our demonstration is that the ~~necessary~~ conditions of perceptual transparency, although studied starting from cases of apparent transparency, are valid

also in the more common case, when physical and perceptual transparency coincide. The problem has widened, it is not more the problem of the conditions of apparent transparency, but the general problem of the perception of transparency without restriction.

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FIGURE 3a

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FIGURE 4

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APPARENT REST

A much more striking example where from a special problem a wider insight develops is the perceptual effect I called apparent rest. If the display reproduced in Fig. 5 is rotated slowly around the center of the semicircle, (4) what we see is a complete resting disk with a series of circles inside, which is periodically covered and uncovered by a rectangle turning on it. If the display of Fig. 6 is rotated slowly around the

center of the inside arc, we see a resting circle periodically covered and uncovered by a peripherically located circle rotating on it.

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FIGURE 5

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The phenomenon was observed by Wittmann (1920) and by Werner and Wildhagen (1929) on fusing two colors with the Maxwell disk (Fig. 7). When the current is interrupted, the rotating disk slows down till resting. When the speed is little, one sees one sector (the minor one) rotating upon a steady disk.

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FIGURE 6

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Strange enough, the above authors did not change sistematically the form of the display but sticked to the Maxell disk. Wittman (5) tried to give an explanation of the phenomenon, asserting that when the subject concentrates on the motion of the minor ~~action~~ sector, the major closes in a circle. An explanation which is evidently wrong, because as more the subject concentrates its attention on the apparently nesting circle, as greater the evidence of the phenomenon (6) of apparent rest.

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FIGURE 7

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1. Changing systhematically the shape of the display, I discovered immediately that the Maxwell disk was the worst display for demonstrating the phenomenon and that the only necessary condition was that at least one part of the contour corresponds to the trajectory of a point. It is therefore perhaps opportune to stress that the phenomenon is not limited to the rotatory motion but can be obtained with translatory motion as well.

A typical example of apparent rest with translatory motion is obtained with apparatus ~~of~~ sketched in Fig. 8, while the reverse of the phenomenon is what we observe traveling with a train when we see the telegraph poles moving, while the ~~cables~~ wires are resting.

2. But the problem can be seen from another angle, that is from the point of view of the retinal stimulation.

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FIGURE 8

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Then the new question is: which modifications on the proximal stimulation are caused by the motion of the target?

Let us try to give a very raw description of it.(7)

It is easy to see that when the target, made of two differently colored regions, rotates, the region stimulated by stimulus a decreases from one side and increases from the other; and the contrary happens to the region stimulated by the b stimulus. The result is that we are perceiving the b region moving upon a steady complete circle.

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FIGURE 9

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But what happens on the proximal stimulation if we imitate with the target what we were perceiving, that is if we use as a target a steady circle upon which a rectangle is turning? (7) Then we see, to our surprise, that what happens on the retinal projection is exactly the same; the a region is increasing on one side and decreasing on the other, and the contrary happeness to the b region. Therefore, as the stimulation is the same in both cases, the perception is necessarily the same. ~~on both cases, the perception is necessarily the same~~.

The explanation is very simple and there is no more problem. Our problem seems to have disappeared.

However, a more through analysis shows that not everything has been explained. Because, while it is clear that, the stimulation being the same, the perception has to be the same,

it is by no means clear why we perceive in both cases a figure rotating and a resting one, and not the whole configuration rotating. In other words, why do we see in both cases a rectangle turning on a resting complete circle and not half circle rotating together with a rectangle?

It is interesting to point out that the problem has widened: it no more regards the illusion only, but the non-illusory situation also.

4. Than we are faced with a more general problem: what happens on the retina when an object is moving upon a ground?

a) to study a typical example, let us simplify the case considering an homogeneously colored figure moving in front of a differently homogeneously colored ground (Fig. 10).

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FIGURE 10

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The reslt - on the proximal stimulation - is that an homogeneously stimulated region corresponding to the figure is increasing on one side and decreasing on the other, while the contrary is happening to the other homogeneously stimulated region corresponding to the ground. Then, there are two homogeneously stimulated regions that are increasing on one side and decreasing on the other - they are both non moving. So there seems to be no motion at all on the retina. But there is

something - the border between the two regions, - that is the abrput jump of stimulation between one region and the other— which is wandering.

b) ~~Not~~ Now let us consider the encounter of the moving figure with another (still differently colored but homogeneous) figure, which is resting. We are interested in two different possibilities. Either (1) the moving figure is passing behind the resting figure, or (2) in front ~~for~~ of it.

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FIGURE 11

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(1) At the moment of the encounter, the stimulation corresponding to the moving object is decreasing on one side and immediately or after a while increases on the other side, on the expense of the ground. But (2) as it passes in front of the figure it is the resting figure which decreases on the same side, but this time at the profit of the stimulation corresponding to the moving figure, while immediately or after a time on the other side it is growing at the expese of the stimulation corresponding to the ground.

While in the first case (1) the moving figure was shrinking (because it was decreasing on one side ~~which~~ while remaining unchanged on the other side) till sometimes disappearing and then widening, in the second case (2), that is, when the figure was moving in front of the resting figure, it is the resting

figure that shrinks at the beginning, than sometimes disappears and then widens till regaining her prior size and form.

The moving as well as the resting figure are both giving rise to increasng and the decreasing of homogeneously stimulated regions, not to motion. But what about the borders? We see that there are borders between homogeneously stimulated regions that are resting and borders that are shifting. The borders of the retinal projection of the steady figure are steady while the borders of the moving figure are shifting.

5. Now let us go back to our illusion. What happens of the borders of the retinal projection of the apparently resting part of our configuration? They are decreasing on one side and ~~de~~increasing on the other (as the borders of the retinal projection of the steady figure do, when it is covered or uncovered by the moving figure), but they are resting as the borders of the steady figure do.

So we are faced with two types of borders, the shifting borders of the retinal projection of the moving figure, which we shall call kinetically active borders and the resting borders of the projection of the steady figure (as well as those of the projection of the apparently resting figure of the illusory configuration) which we shall call kinetically non-active borders.

But let us see what happens when a configuration (an object like our target) has some of the borders which are kinetically active, and some kinetically unactive, that is it has

kinetically unhomogeneous borders. What happens in this case is our illusory reslt: the configuration splits in two objects, each of them with kinetically homogeneous borders.

But this case is all but exceptional. Every time when a moving figure is passing in front or at the back of a resting figure, a similar situation can arise at the retinal projection's level, ~~an object moves in front or behind another object~~, giving rise to a configuration with kinetically inhomogeneous borders. Through a tendency towards kinetically homogeneous borders a moving figure wandering in front or behind a resting one is seen.

So, when an object is moving in a field of resting objects, instead of a caleidoscopic change of widening and strinking figures, through the tendency to kinetically homogeneous borders, the real thing is perceived.

THE DISAPPEARANCE OF A HOLE

The third example of a problem regarding an illusion, whose study appears to be interesting above the mere illusion, is the problem of the perception of a hole.

The illusion is simply demonstrated, without any apparatus.

We only need a cardboard with a hole in its central region, through which we see a part of an homogeneous region of different color. The hole, if the surface behind it is homogeneous, is not perceived as a hole, but as a figure, plasted on the cardboard, having as borders the borders of the hole. Varying every condition (form, size, color) we see that although there are conditions favoring or hindering the phenomenon, - Dr Cavedon made a qualitative study of it - it resulted that the only necessary ~~one~~ condition to obtain the illusion appeared to be the homogeneity (8) of the surface visible through the hole. But we ~~already learned the lesson~~ know that what really matters is not what happens on the target, but the stimulus conditions at the retinal level. Here we see that there is a difference between the stimulation provided by a piece of paper of different color attached on a screen and a hole in the screen, only if the bottom of the hole is not homogeneous, but there is no difference if the hole is homogeneous, because in this case here is nothing that could give rise to retinal disparity, or to differential focussing, that is to depth perception. Again the problem seems to have disappeared.

Bur there is a problem unsolved in this case also: why do we see, in both cases, a paper attached on the surface and not a hole? The question seems to be solved by the onesided functioning of the border, the border being perceived as a part of the included and not of the including region of the field - a discovery due to Rubin and Koffka. But again, why is the

border functioning this way? And than, a strange exception. If the insides of the hole is dark black, notwithstanding its perfect homogeneity, it is perceived as a hole.

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FIGURE 12

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So there are still several unanswered questions. The research in this field has been carried on by Prof. Da Pos and by Dr. Cavedon, Prof. Da Pos having observered a very interesting effect of apparent fog, and Dr. Cavedon having been able to obtain the opposite effect, putting on light some special conditions giving rise to the perception of a hole, when no real hole exists.

SUMMARY

The function of perceptual illusions in research is iscussed and demonstrated analysing three perceptual illusions observed and studied by the Author: the apparent transparency, the apparent rest and the disappearing of a hole.

NOTES

1. In the target the parallel segments of the Muller-Lyer figure are equal, ~~which~~ while in the perceptual configuration they are unequal.

2. K. Koffka, Principles of Gestalt Psychology, Cap.II.

3. The color can be varied without any effect on the phenomenon.

4. If the display is reproduced in normal size (radius about 15 cm) the effect can be observed at home, using a turnable for records.

5. I was not able to retrace, either asking Professor Werner hymself or at Hamburg University, W. and W.'s paper.

6. This shift of attention succeeds easier with display of Fig. 5 or 6.

7. We confine ~~observer's task~~ us to take into consideration Fig. 5, for the sake of simplicily.

8. Often this symple demonstration does not suceed because the surface behind the hole is not really homogeneous (if it is a wall, there are shadows on it). But Prof. Da Pos constructed a symple gadget, with constant illumination, which makes coercive for every subject the disappearance of the hole.

THE FUNCTION OF PERCEPTUAL ILLUSIONS IN RESEARCH

As the subject of this paper are perceptual illusions, it is perhaps useful to begin with a definition. According to Professor Rausch it is a case to speak of a perceptual illusion when the attributes of a perceived configuration differ from the corresponding characteristics of the target.

I give an example from the well known geometric optical illusions (Muller-Lyer, Fig.1) in order to clarify the meaning of the concepts of target and perceptual configuration. (1) But the demonstrations describet~~ions~~ ~~discrepancy~~ in ~~was~~ and discussed this paper will not concern the geometric-optical illusions.

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FIGURE 1

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At this point it ~~this~~ is quite natural to ask the following question. Why have the perceptual illusions an important place in ~~almost every handbook of~~ Psychology? Are not illusions unimportant little problems which only a pedant can choose as object of research?

Such a radical point of view was represented by James Gibson ~~a dear friend of mine who died years ago.~~ We discussed several times this topic, the last time some months before his end.

At my opinion there is a special reason to stress the importance of perceptual illusions. I shall begin with stating briefly my theoretical standpoint; however the main part of this paper will consist in demonstrating and discussing some phenomena which will serve to illustrate the theory.

At the beginning, but not only at the beginning, but often also ~~verhaps~~ nowdays, the illusions were considered as exceptions, where our sensory apparatus did not function well, and therefore did not give, as it always do, true and trustworthy information about the real world. They were studied and are still introduced as interesting special problems.

A point of view that never has been completely put aside ~~in~~ is that the sensory apparatus cannot lie, and therefore higher functions have been looked for, interfering with sensory data and being the origins of perceptual illusions.

It is however possible to consider perceptual illusions in a quite different way. According to this point of view they are considered alarm signals, breaks in the cuirass of our maive realism, through which the difference between perceptual and real becomes directly visible.

The very function of perceptual illusions is to force us to see a problem where before there seemed to be no problem at all.

It has been always very interesting for me to ascertain that not only the layman, the ordinary man, but also the specialist who founded all his research on the difference between

perceptual and real, falls back, in his common life and behavior, to maive realism in an absolutely natural way: what he ~~needs~~ sees is a car and not a ~~macular~~ moment he is thinking that it s the perception of a car.

It is necessary, in order to live a normal life, to ignore or at least to disgregard the difference between perceptual world and reality (behavioral and geographical environment, according to Koffka's original concepts). (2)

We have a typical way to defend ourselves and to preserve our realism. If we stumble in a step we simply say that we did not see or did not notice it. And in the same way we do often explain the tragis happening of a car accident: we did not see the perosn. It is clear that, according to the previous ~~instruction~~ distinction between behavioral (or perceptual) and geographical (or real) environment, the step, or the person did not exist in our perceptual world. But with our explanation we are meaning that we should have been able to see the object under~~estimation~~ discussion, if we had only changed the direction of our look, or if we had changed the concentration of our attention. What we mean is that the perceptual apparatus was functioning exactly but we did not use it in the right way.

But ~~they~~ there are cases and these are just the perceptual illusions, where this explanation does not hold. In these cases, direction of look and attention ~~we~~ do not help to perceive what really is there.

Let us take as an example the famous Ganzfeld experiment of

Wertheimer ~~and Metzger~~. There is a wall in front of us, and we see just fog. In this case there is no way to escape the problem, to make disappear the phenomenon. Change in attention or in directing the look does not change what we are seeing. This type of phenomena generates a crisis of our naive realism.

We have to explain why we do not see the wall, although it is in front of us. Our first attitude in these cases is to look for a solution of the illusion as a special limited phenomenon. What we ask is: why (not our) peripheral apparatus regularly function in this special case although as a rule it gives us a true reproduction of reality?

This is the natural way to follow, at first, for every perceptual illusion. It is like we behave if in an old building: a piece of plaster falls from a wall and we get it repaired so that the color is almost homogeneous eterogeneous and for the superficial observer ovewer there is no fault to see. The same can happen a secord, a third time. But sooner or later the whole plaster falls, and with big amazement and happiness we discover that a fresco was hidden under the plaster.

Something similar happens, soomer or later, when a perceptual illusion in studied.

Let us go back to the Ganzfeld-Phenomenon. The first, and more natural question is "Why don"t we see the wall? But suddenly - after a more or less long delay - we discover that this is only a partial problem. Then we ask ourselves not only under which conditions we see fog instead of a wall, but also

under which conditions do we see a wall, when a wall is really in front of us. Why do we see, in this case, the color condensed on a surface in front of us, and before it a colorless transparent space? And why does the problem concern only the wall? under which condition do we see a chair, a desk, a book when these objects are being in front of us?

In this sense the perceptual illusions are precious signals forcing us or aiding us to acknowledge a problem where there seemed to be no problem and every thing appeared ~~so~~ to be obvious. In this sense the perceptual illusions took an important part to the birth of the modern perception psychology and convinced us perception psychologists (I think at least the majority of us) that the perceptual world - the only world with which we have direct contact - is all a set of problems, which have to be discovered - and this is often the most serious difficulty - before trying to solve them.

With this assertion I am ending the first part of my paper. Now I'll try to show - using as examples some perceptual illusions which have been observed and studid by my collaborators and me, the development of the problems according to what ~~I~~ we said before, that is to show ~~hers~~ how from a limited special problem a wider insight develops.

APPARENT TRANSPARENCY

Apparent Transparency

My first example of a perceptual illusion is apparent transparency. Of course, studing the perception of transparency we have to answer a natural objection. Transparency is not a perceptual but a physical problem, we perceive transparency when a physical object is permeable to the light. Therefore we have to begin showing that physical transparency is neither a necessary nor a sufficient condition for perceiving transparency.

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FIGURE 2

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The display represented in Fig. 2 is generally perceived as transparent. But there is nothing physically transparent there. It is just a mosaic of opaque pieces of cardboard of different color. So, physical transparency is not a necessary condition for perceiving transparency, or in other words, there are cases of apparent transparency. On the contrary, nobody perceives transparency in the display of Fig. 3, while the red plastic which is glued upon white cardboard is physically transparent.(3) And this proovs that physical transparency is not a sufficient conditione to perceive transparency.

FIGURE 3

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But thinking of the stimulation originating the perception of transparency it is clear that the visual system does not receive any information about the conditions giving rise to it, namely if the light rays stimulating the retina passed or not through a transparent medium.

How do we study perceptual transparency? As every other perceptual phenomenon, changing the conditions systematically, especially the colors and the forms of the surfaces giving rise to it. Following this way ~~my collaborators and I~~ we have been able to formulate mathematically the ~~necessary~~ conditions of the perception of transparency.

But here I have to confine myself to a little demonstration, which is in a way typical as it shows an important aspect of the phenomenon. Putting two displays 3 and 3a together in such way that there is continuity between the borders of the plastics, transparency is perceived. We are forced to draw the conclusion that transparency depends on a complex stimulation of the visual organ. It is what we call a gestalt phenomenon, or in other words it does not depend on local stimulation, which did not change. Fig 3A Fig 4

~~But~~ The conclusion of our demonstration is that the ~~necessary~~ conditions of perceptual transparency, although studied starting from cases of apparent transparency, are valid

also in the more common case, when physical and perceptual transparency coincide. The problem has widened, it is not more the problem of the conditions of apparent transparency, but the general problem of the perception of transparency without restriction.

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FIGURE 3a

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FIGURE 4

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APPARENT REST

A much more striking example where from a special problem a wider insight develops is the perceptual effect I called apparent rest. If the display reproduced in Fig. 5 is rotated slowly around the center of the semicircle (4) what we see is a complete resting disk with a series of circles inside, which is periodically covered and uncovered by a rectangle turning on it. If the display of Fig. 6 is rotated slowly around the

center of the inside arc, we see a resting circle periodically covered and uncovered by a peripherically located circle rotating on it.

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FIGURE 5 Figure 6

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The phenomenon was observed by Wittmann (1920) and by Werner and Wildhagen (1929) on fusing two colors with the Maxwell disk (Fig. 7). When the current is interrupted, the rotating disk slows down till resting. When the speed is little, one sees one sector (the minor one) rotating upon a steady disk.

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FIGURE 6

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Strange enough, the above authors did not change sistematically the form of the display but sticked to the Maxwell disk. Wittman (5) tried to give an explanation of the phenomenon, asserting that when the subject concentrates on the motion of the minor ~~action~~ sector, the major closes in a circle. An explanation which is evidently wrong, because as more the subject concentrates its attention on the apparently nesting circle, (not on the moving object) as greater the evidence of the phenomenon (6).

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FIGURE 7

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1. Changing systhematically the shape of the display, I discovered immediately that the Maxwell disk was the worst display for demonstrating the phenomenon and that the only necessary condition was that at least one part of the contour corresponds to the trajectory of a point. It is therefore perhaps opportune to stress that the phenomenon is not limited to the rotatory motion but can be obtained with translatory motion as well.

A typical example of apparent rest with translatory motion is obtained with apparatus of Fig. 8. While the reverse of the phenomenon is what we observe traveling with a train when we see the telegraph poles moving, while the rails are resting.

2. But the problem can be seen from another angle, that is from the point of view of the retinal stimulation.

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FIGURE 8

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Then the new question is: which modifications on the proximal stimulation are caused by the motion of the target?

Let us try to give a very raw description of it.(7)

It is easy to see that when the target, made of two differently colored regions, rotates, the region stimulated by stimulus a decreases from one side and increases from the other; and the contrary happens to the region stimulated by the b stimulus. The result is that we are perceiving the b region moving upon a steady complete circle.

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FIGURE 9

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But what happens on the proximal stimulation if we imitate with the target what we were perceiving, that is if we use as a target a steady circle upon which a rectangle is turning? Then we see, to our surprise that what happens on the retinal projection is exactly the same, the A region is increasing on one side and decreasing on the other, and the contrary happeness to the B region. Therefore, as the stimulation is the same in both cases, the perception is necessarily the same. ~~on both cases, the perception is necessarily the same~~.

The explanation is very simple and there is no more problem. Our problem seems to have disappeared.

3. However, a more through analysis shows that not everything has been explained. Because, while it is clear that, the stimulation being the same, the perception has to be the same,

it is by no means clear why we perceive in both cases a figure rotating and a resting one, and not the whole configurating rotating. In other words, why do we see in both cases a rectangle turning on a resting complete circle and not half circle rotating together with a rectangle?

It is interesting to point out that the problem has widened: it no more regards the illusion only but the non-illusory situation also.

4. Than we are faced with a more general problem: what happens on the retina when an object moving upon a ground?

a) to study a typical example, let us simplify the case considering an homogeneously colored figure moving in front of a differently homogeneously colored ground (Fig. 10).

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FIGURE 10

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something, at the border between the two regions, - that is the abrupt jump of stimulation between one region and the other - which is wandering.

b) Now let us consider the encounter of the moving figure with another (still differently colored but homogeneous) figure, which is resting. We are interested in two different possibilities. Either (1) the moving figure is passing behind the resting figure, or (2) in front for it.

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FIGURE 11

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(1) At the moment of the encounter, the stimulation corresponding to the moving object decreases on one side and after a while increases on the other side, on the expense of the ground. But (2), as it passed in front of the figure, it is the resting figure which decreases on the same side, but this time at the profit of the stimulation corresponding to the moving figure, while after a time on the other side it is growing at the expese of the stimulation corresponding to the ground.

While in the first case (1) the moving figure was shrinking (because it was decreasing on one side while remaining unchanged on the other side) till sometimes disappearing and then widening, in the second case (2), that is, when the figure was moving in front of the resting figure, it is the resting

figure that shrinks at the beginning, than sometimes disappears and then widens till regaining her prior size and form.

The moving, as well as the resting figure are both giving rise to the increasng and the decreasing of homogeneously stimulated regions, not to motion. But what about the borders? We see that there are borders between homogeneously stimulated regions that are resting and borders that are shifting. The borders of the retinal projection of the steady figure are steady while the borders of the moving figure are shifting.

5. Now let us go back to our illusion. What happens of the borders of the retinal projection of the apparently resting part of our configuration? They are decreasing on one side and decreasing on the other (as the borders of the retinal projection of the steady figure do, when it is covered or uncovered by the moving figure), but they are resting as the borders of the steady figure do.

So we are faced with two types of borders, the shifting borders of the retinal projection of the moving figure, which we shall call kinetically active borders and the resting borders of the projection of the steady figure as well as those of the projection of the apparently resting figure of the illusory configuration, which we shall call kinetically non-active borders.

But let us see what happens when a configuration (an object like our target) has some of the borders which are kinetically active, and some kinetically unactive, that is it has

kinetically unhomogeneous borders. What happens in this case is our illusory result: the configuration splits in two objects, each of them with kinetically homogeneous borders.

But this case is all but exceptional. Every time when a moving figure is passing in front or at the back of a resting figure, a similar situation arises at the retinal projection's level: an object moves in front or behind another object, giving rise to a configuration with kinetically inhomogeneous borders.

Through the tendency towards kinetically homogeneous borders a moving figure wandering in front or behind a resting one is seen.

So, when an object is moving in a field of resting objects, instead of a caleidoscopic change of widening and shrinking figures, through the tendency to kinetically homogeneous borders, the real thing is perceived.

THE DISAPPEARANCE OF A HOLE

The third example of a problem regarding an illusion, whose study appears to be interesting above the mere illusion, is the problem of the perception of a hole.

The illusion is simply demonstrated, without any apparatus.

We only need a cardboard with a hole in its central region, through which we see a part of an homogeneous region of different color. The hole, if the surface behind it is homogeneous, is not perceived as a hole, but as a figure, plasted on the cardboard, having as borders the borders of the hole. Varying every condition (form, size, color) we saw that although there are conditions favoring or hindering the phenomenon, Dr Cavedon made a qualitative study of it - the only necessary condition to obtain the illusion appeared to be the homogeneity of the surface visible through the hole. But we already learned the lesson that what really matters is not what happens on the target, but the stimulus conditions at the retinal level. Here we see that there is a difference between the stimulation provided by a piece of paper of different color attached on a screen and a hole in the screen only if the bottom of the hole is homogeneous, but there is no difference if the hole is homogeneous, because in this case there is nothing that could give rise to retinal disparity, or to differential focussing, that is to depth perception. Again the problem seems to have disappeared.

Bur there is a problem unsloved in this case also: why do we see, in both cases, a paper attached on the surface and not a hole? The question seems to be solved by the onesided functioning of the border, the border being perceived as a part of the included and not of the including region of the field - a discovery due to Rubin and Koffka. But again, why is the

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FIGURE 12

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So there are still several unanswered questions. The research in this field has been carried on by Prof. Da Pos and by Dr. Cavedon. Prof. Da Pos having observered a very interesting effect of apparent fog, and Dr. Cavedon having been able to obtain the opposite effect, putting on light some special conditions giving rise to the perception of a hole, when no real hole exists.

SUMMARY

The function of perceptual illusions in research is discussed and demonstrated analysing three perceptual illusions observed and studied by the Author and his collaborators: the apparent transparency, the apparent rest and the disappearing of a hole.

NOTES

1. In the target the parallel segments of the Muller-Lyer figure are equal, which in the perceptual configuration they are unequal.

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(8) It has to be a real black, with reflectance near to zero

8. Often this symple demonstration does not suceed because the surface behind the hole is not really homogeneous (if it is a wall, there are shadows on it). But Prof. Da Pos constructed a symple gadget, which makes coercive for every subject the disappearance of the hole.

Bibliography
Review

THE FUNCTION OF PERCEPTUAL ILLUSIONS IN RESEARCH (*)

Fabio Metelli

University of Padua (Italy), Department of Psychology

As the subject of this paper is perceptual illusions, it is perhaps useful to begin with a definition. According to Professor Rausch we speak of a perceptual illusion when the attributes of a perceived configuration differ from the corresponding characteristics of the target.

I give an example from the well known geometric optical illusions (Muller-Lyer, Fig.1) in order to clarify the meaning of the concepts of target and perceptual configuration. (1) But the demonstrations described and discussed in this paper will not concern the geometric-optical illusions.

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FIGURE 1
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At this point it this quite natural to ask the following questions. Why do the perceptual illusions have an important

place in Psychology? Are not illusions unimportant little problems?

Such a radical point of view was represented by James Gibson. We discussed this topic several times, the last time some months before he ~~passed away~~ died.

In my opinion there is a special reason ~~in~~ for stressing the importance of perceptual illusions. I shall begin by stating briefly my theoretical point of view. ~~However,~~ Then the main part of this paper will consist of demonstrating and discussing some phenomena which will serve to illustrate the theory.

At the beginning of experimental research in Psychology, but not only at the beginning, and often ~~also~~ nowadays, too, the illusions were considered as exceptions, ~~where~~ in which our sensory apparatus did not function well, and therefore did not give, as it always does, true and trustworthy information about the real world. They were studied and are still studied as interesting special problems.

A point of view that has never been completely put aside is that the sensory apparatus cannot lie, and therefore a search has to be made for higher functions interfering with sensory data, ~~and~~ which are the origins of perceptual illusions.

It is however possible to consider perceptual illusions in a quite different way. According to this point of view they are considered alarm signals, breaks in the ~~cuirass~~ armor of our naive realism, through which the difference between perceptual and real becomes directly visible.

The very function of perceptual illusions is to force us to see a problem where before there seemed to be no problem at all.

It has always been very interesting for me to ascertain that not only the layman, the ordinary man, but also the specialist who founded all his research on the difference between perceptual and real, falls back, in his everyday life and behavior, ~~to~~ on naive realism in an absolutely natural way. What he sees is a car and not for a moment does he think that it is the perceptual image of a car.

It is necessary, in order to live a normal life, to ignore or at least to disregard the difference between the perceptual world and reality (behavioral and geographical environment, according to Koffka's original concepts). (2)

We have a typical way of defending ourselves and preserving our naive realism. If we stumble on a step we simply say that we did not see or did not notice it. And in the same way we often explain the tragic happening of a car accident: we did not see the person. It is clear that, according to the previous distinction between behavioral (or perceptual) and geographical (or real) environment, the step, or the person did not exist in our perceptual world. But with our explanation we mean that we should have been able to see the object under discussion, if we had only changed the direction of our ~~look~~ regard, or if we had changed the concentration of our attention. What we mean is that the perceptual apparatus was functioning correctly but we

did not use it in the right way. But there are cases, and these are just the perceptual illusions, where this explanation does not hold. In these cases, direction of ~~look~~ regard and attention do not help to perceive what is "really" there.

Let us take as an example the famous Ganzfeld experiment discovered by Wertheimer and studied by Metzger. There is a wall in front of us, and we see just fog. In this case there is no way to escape the problem, to make the phenomenon disappear. Change in attention or in directi~~ng the look~~ on of regard does not change what we are see~~ing~~. This type of phenomena generates a crisis ~~in~~ for our naive realism.

We have to explain why we do not see the wall, although it is ~~a~~ in front of us. Our first attitude in these cases is to look for a solution of the illusion as a special limited phenomenon. What we ask is: why did not the peripheral apparatus ~~regularly~~ correctly function in this special case although as a rule it gives us a true reproduction of reality?

Let us go back to the Ganzfeld-Phenomenon. The first, and more natural question is: Why don't we see the wall? But suddenly -- after a short or longer delay -- we discover that this is only a part~~ial~~ of the problem. Then we ask ourselves not only under which conditions we see fog instead of a wall, but also under which conditions we see a wall, when a wall is really in front of us. Why do we see, in this case, the color condensed on a surface in front of us, and before it a colorless transparent space? And why does the problem concern only the

wall? Under which condition do we see a chair, a desk, a book when these objects are in front of us?

In this sense the perceptual illusions are precious signals forcing us or aiding us to acknowledge a problem where there seemed to be no problem and everything appeared to be obvious. In this sense the perceptual illusions played an important part in the birth of ~~the~~ modern Perception psychology and convinced us Perception psychologists (I think at least the majority of us) that the perceptual world -- the only world with which we have direct contact -- is all a set of problems, which have to be discovered -- and this is often the most serious difficulty -- before trying to solve them.

With this assertion I ~~am~~ end~~ing~~ the first part of my paper. Now I ~~'ll~~ shall try to show-- using as examples some perceptual illusions which have been observed and studied by my collaborators and ~~I~~ me -- the development of the problems according to what I said before, that is, to show how a wider insight develops from a limited special problem.

APPARENT TRANSPARENCY

My first example of a perceptual illusion is apparent transparency. Of course, ~~studying~~ the study of the perception of transparency ~~we have to answer~~ raises a natural objection. Transparency is not a perceptual but a physical problem, we perceive transparency when a physical object is permeable to the light. Therefore we have to begin by showing that physical transparency is neither a necessary nor a sufficient condition for perceiving transparency.

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FIGURE 2
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The display represented in Fig. 2 is generally perceived as transparent. But there is nothing physically transparent there. It is just a mosaic number? of opaque pieces of cardboard of different color. So, physical transparency is not a necessary condition for perceiving transparency, or in other words, there are cases of apparent transparency. On the contrary, nobody perceives transparency in the display of Fig. 3, while the red plastic which is glued upon a white cardboard is physically transparent.(3) And this proves that physical transparency is not a sufficient condition ~~to~~ of perceived transparency.

==========
FIGURE 3
==========

As to responsible for?

~~But thinking of~~ the stimulation ~~originating~~ the perception of transparency, it is clear that the visual system does not receive any information about the conditions giving rise to transparency, namely ~~if~~ whether the light rays stimulating the retina passed or not through a transparent medium.

How do we study perceptual transparency? As every other perceptual phenomenon, by changing the conditions systematically, especially the colors and the forms of the surfaces giving rise to it. In this way, we have been able to formulate mathematically some conditions of the perception of transparency. (McTell 1970, 1985)

But here I have to confine myself to a little demonstration, which is in a way typical as it shows an important aspect of the phenomenon. Putting the two displays 3 and 3a together in such a way that there is continuity between the borders of the plastics (Fig. 4), transparency is perceived. We are forced to draw the conclusion that transparency depends on a complex stimulation of the visual organ. It is what we call a gestalt phenomenon, or in other words it does not depend on local stimulation, which in our example did not change.

==========
FIGURE 3a
==========

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FIGURE 4
==========

But the conclusion of our demonstration is that the conditions of perceptual transparency, although studied first with ~~starting from~~ cases of apparent transparency, are valid also in the more common case, when physical and perceptual transparency coincide. The problem has widened, it is no more the problem of the conditions of apparent transparency, but the general problem of the perception of transparency without restriction.

APPARENT REST

A much more striking example in which ~~where~~ a wider insight develops from a special problem, is the perceptual effect I call~~ed~~ apparent rest. If the display reproduced in Fig. 5 is rotated slowly around the center of the semicircle, (4) what we see is a complete resting disk with a series of circles inside, which is periodically covered and uncovered by a rectangle turning on it. If the display of Fig. 6 is rotated slowly around the center of the inside arc, we see a resting circle periodically covered and uncovered by a peripherically located circle rotating on it.

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FIGURE 5
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The phenomenon was observed by Wittmann (1920) and by Werner and Wildhagen (1929) ~~on~~ when fusing two colors with the Maxwell disk (Fig. 7). When the current is interrupted, the rotating disk slows down ~~till resting.~~ until it comes to rest? When the speed is slow, one sees one sector (the ~~minor~~ smaller one) rotating upon a steady disk.

==========
FIGURE 6
==========

Strangely enough, the above authors did not change the form of the display systematically, but stuck to the Maxwell disk. Wittman (5) tried to give an explanation of the phenomenon, asserting that when the subject concentrates on the motion of the ~~minor~~ smaller sector, the ~~major~~ larger one closes in a circle. An explanation which is evidently wrong, because the more a subject concentrates ~~its~~ his attention on the apparently resting circle, the greater the evidence of the phenomenon (6) of apparent rest.

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FIGURE 7
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1. Changing systematically the shape of the display, I

discovered immediately that the Maxwell disk was the worst display for demonstrating the phenomenon and that the only necessary condition was that at least one part of the contour corresponds to the trajectory of a point. It is therefore perhaps opportune to stress that the phenomenon is not limited to the rotatory motion but can be obtained with translatory motion as well.

A typical example of apparent rest with translatory motion is obtained with the apparatus sketched in Fig. 8, while the ~~reverse of the~~ phenomenon connected with induced motion is what we observe travelling ~~with~~ on a induced motion train when we see the telegraph poles moving, while the wires are rest~~ing~~at.

2. But the problem can be seen from another angle, that is from the point of view of the retinal stimulation.

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FIGURE 8
==========

X exp.

Then the new question is: ~~which~~ what modifications ~~on~~ of the proximal stimulation are caused by the motion of the target? Let us try to give a very rough description of it.

It is easy to see that when the target, made of two differently colored regions, rotates, the region stimulated by stimulus a decreases on one side and increases on the other; and the contrary happens to the region stimulated by the b stimulus. The result is that we are perceiving the b region

moving over a steady complete circle.

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FIGURE 9
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But what happens at the proximal stimulation level if we imitate with the target what we were perceiving, that is if we use as a target a steady circle upon which a rectangle is turning? (7) Then we see, to our surprise, that what happens on the retinal projection is exactly the same: the a region is increasing on one side and decreasing on the other, and the contrary happens to the b region. Therefore, as the stimulation is the same in both cases, the perception is ~~necessarily~~ the same.

The explanation is very simple and there is no longer a problem. Our problem seems to have disappeared.

3. However, a more thorough analysis shows that not everything has been explained. Because, while it is clear that, when the stimulation is the same, the perception has to be the same, it is by no means clear why we perceive in both cases a figure rotating and a resting one, and not the whole configuration rotating. In other words, why do we see in both cases a rectangle turning on a resting complete circle and not a half circle rotating together with a rectangle?

It is interesting to point out that the problem has widened: it ~~doesnt any~~ no longer regards the illusion only, but the

non-illusory situation as well.

4. Then we are faced with a more general problem: what happens on the retina when an object is moving upon a background?

a) to study a typical example, let us simplify the case considering a~~n~~ homogeneously colored figure moving in front of a different homogeneously-colored background (Fig. 10).

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FIGURE 10
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The result -- ~~on~~ in the proximal stimulation -- is that a~~n~~ homogeneously stimulated region corresponding to the figure is increasing on one side and decreasing on the other, while the contrary is happening to the other homogeneously stimulated region corresponding to the background. Then, there are two homogeneously stimulated regions that are increasing on one side and decreasing on the other -- they are ~~both~~ at a stand-still. So there ~~seems to be~~ is no motion at all on the retina. But there is something -- the border between the two regions, -- that is the abrupt jump of stimulation between one region and the other, which is ~~wandering~~ moving. (Figure 11)

b) Now let us consider the encounter of the moving figure with another (still differently colored but homogeneous) figure, which is ~~resting~~ at rest. We are interested in two different possibilities. Either (1) the moving figure is passing behind

Avg?

the resting figure, ~~or~~ (Figure 11) (2) ~~in~~ passing in front of it.

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FIGURE 11
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(1) At the moment of the encounter, the stimulation corresponding to the moving object decreases on one side and immediately, or after a while, increases on the other side, at the expense of the background. But (2) as it passes in front of the figure it is the resting figure which decreases on the same side, but this time to the advantage of the stimulation corresponding to the moving figure, while immediately, or after a time, on the other side it is growing at the expense of the stimulation corresponding to the ground.

While in the first case (1) the moving figure was shrinking (because it was decreasing on one side while remaining unchanged on the other side) ~~till sometimes disappearing~~ until it disappeared? and then widen~~ing~~ed, in the second case (2), that is, when the figure was moving in front of the resting figure, it is this figure that shrinks at the beginning, then sometimes disappears and then widens ~~till~~ until regaining its prior size and form.

The moving as well as the resting figure both give rise to the increasing and the decreasing of homogeneously stimulated regions, not to motion. But what about the borders? We see that there are borders between homogeneously stimulated regions that are resting and borders that are shifting. The borders of the

retinal projection of the steady figure are steady while the borders of the moving figure are shifting.

5. Now let us go back to our illusion. What happens to the ~~borders~~ limits of the retinal projection of the apparently resting part of our configuration? They are increasing on one side and decreasing on the other (as do the borders of the retinal projection of ~~the~~ a steady figure, when covered or uncovered by ~~the~~ a moving figure), but they are resting as the borders of the steady figure do. are not shifting

So we are faced with two types of borders, the shifting borders as are perceived of the retinal projection of the moving figure, which we shall call <u>kinetically active borders</u>, and the resting borders as are perceived of the projection of the steady figure (as well as those of the projection of the apparently resting figure of the illusory configuration) which we shall call <u>kinetically non-active borders</u>.

But let us see what happens when a configuration (an object like our target) has some ~~of the~~ borders which are kinetically active, and some kinetically ~~un~~inactive, that is it has <u>kinetically ~~un~~homogeneous borders</u>. What happens in this case is our illusory result: the configuration splits in two objects, (a resting circle and a rotating rectangle) each of them with kinetically homogeneous borders.

But this case is all but exceptional. Every time a moving figure is passing in front or behind a resting figure, a similar situation can arise at the level of the retinal projection, ~~'s level,~~ giving rise to a configuration with kinetically <u>inhomogeneous</u>

borders: through a tendency towards kinetically homogeneous borders a moving figure wandering in front or behind a resting one is seen.

So, when an object is moving in a field of resting objects, instead of a kaleidoscopic change of widening and shrinking figures, through the tendency to kinetically homogeneous borders, ~~the real thing is perceived.~~ object The perceptised configuration ~~[illegible]~~ assumes the characteristics corresponding to the target.

THE DISAPPEARANCE OF A HOLE

The third example of a problem regarding an illusion, the study of which appears to be interesting ~~part~~ apart from the mere illusion, is the problem of the perception of a hole.

The illusion is simply demonstrated, without any apparatus. We only need a cardboard with a hole in its central region, through which we see a part of a homogeneous region of a different color. (Fig 12 The hole, if the surface behind it is homogeneous, is not perceived as a hole, but as a figure, pasted on the cardboard, having as borders the borders of the hole. Varying every condition (form, size, color) we see that although there are conditions favoring or hindering the phenomenon -- Dr. Cavedon made a qualitative study of it -- it ~~resulted~~ appears that the only necessary condition to obtain the

illusion ~~appeared to be~~ is the homogeneity (8) of the surface visible through the hole.

But we know that what really matters is not what happens on the target, but the stimulus conditions at the retinal level. Here we see that there is a difference between the stimulation provided by a piece of paper of a different color attached to a screen and a hole in the screen, only if the bottom of the hole is not homogeneous, but there is no difference if the hole is homogeneous, because in this case here is nothing that could give rise to retinal disparity, or to differential focussing, that is, to depth perception. Again the problem seems to have disappeared.

But there is an unsolved problem in this case also: why do we see, in both cases, a paper attached ~~on~~ to the surface and not a hole? The question seems to be solved by the one-sided functioning of the border, the border being perceived as a part of the included and not of the including region of the field -- a discovery made by Rubin and Koffka. But again, why does the border functio~~ning~~n in this way? And then, a strange exception. If the inside of the hole is deep black, notwithstanding its perfect homogeneity, it is perceived as a hole.

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FIGURE 12
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So there are still several unanswered questions. The

research in this field has been carried out by Prof. Da Pos and by Dr. Cavedon, Prof. Da Pos having observered a very interesting effect of apparent fog, and Dr. Cavedon having been able to obtain the opposite effect, showing up some special conditions giving rise to the perception of a hole, when no real hole exists. in the target. as/ereses

SUMMARY

The function of perceptual illusions in research is discussed and demonstrated by analysing three perceptual illusions observed and studied by the Author: ~~the~~ apparent transparency, ~~the~~ apparent rest and the disappear~~ing~~ance of a hole.

NOTES

* I spoke on this topic several times, mainly abroad (USA, India, Austria), but always with demontrations, arousing some interest. Some colleague friends expressed the opinion that I should publish my talk. I have accepted their encouragement

although such a paper has the ~~big~~ considerable handicap of its lack of demontrations, which were, I think, the most appealing part of my talk.

1. In the target the ~~parallel~~ horizontal segments of the Muller-Lyer figure are equal, while in the perceptual configuration they are unequal.

2. K. Koffka, Principles of Gestalt Psychology, Cap.II. chap. 2.

3. The color can be varied without any effect on the phenomenon.

4. If the display is reproduced in normal size (radius about 15 cm) the effect can be observed at home, using ~~a~~ the turn table ~~for records.~~ of a record player.

5. I was not able to retrace find out either by asking Professor Werner himself or at Hamburg University, W. and W.'s paper. what do you mean?

6. This shift of attention occurs ~~easier~~ more easily with display of Fig. 5 or 6.

7. We confined ourselves to ~~take into consideration~~ Fig. 5, for the sake of simplicity.

8. Often this simple demonstration does not succeed because the surface behind the hole is not really homogeneous (e.g., if it is a wall, there are shadows on it). But Prof. Da Pos constructed a simple ~~gadget~~ apparatus, with constant illumination, which makes the disappearance of the hole coercive for every subject.

Die Funktion der Wahrnehmungstäuschungen für die Forschung

The subject of this Seminar are perceptual illusions

Mein Vortrag betrifft die Wahrnehmungstäuschungen. Es

It is perhaps useful to begin with a definition

ist deshalb vielleicht angemessen mit einer Definition anzufangen.

According to a famous specialist on the subject, professor Erwin Rausch

Nach einem berühmten Spezialisten dises Gebietes, Professor

of the Univ. of Frankfurt in Germany, the case to speak of perceptual

Edwin Rausch ist es von Täuschung zu sprechen sofern die

illusions when the ~~relations~~ characteristics of the ~~perceived~~ configuration

ATTRIBUTES

Verhältnisse (die metrischen Verhältnisse im Falle der Geometrik-

differ from the corresponding characteristics [of the configuration] of the Target

optischen Täuschungen) der wahrhenommenen Configuration sich

I give an example FROM THE WELL KNOWN GEOM-OPTICAL ILLUSIONS

von den zugehörigen Verhältnissen der Vorlagekonfiguration

But I intend TO SPEAK OF PERCEPTUAL ILLUSIONS IN A WIDER

unterscheiden.* Hier werde ich ~~habe~~ nicht von geometrisch-optischen

MEANING

Täuschungen sprechen, sondern von Wahrnehmungstäuschungen im

weiteren Sinne.

AT THIS POINT IT IS QITE NATURAL TO ASK THE

Da wir nun das Gegenstandsgebiet festgestellt haben,

FOLLOWING QUESTION. WHY HAVE THE PERCEPTUAL ILLUSIONS

kommt fast von sich selbst eine natürliche Frage. Warum haben

AN IMPORTANT PLACE IN ALMOST EVERY HANDBOOK OF PSYCHOLOGY?

die Wahrnemungstäuschungen einen besonderen Platz in jedem

ARE NOT THE ILLUSIONS UNIMPORTANT LITTLE PROBLEMS

Handbuch der Psychologie? Sind sie wirklich so bedeutend, oder

WHICH ONLY A PEDANT CAN CHOOSE AS OBJECT OF

handelt es sich schliesslich um unwichtige kleine Probleme die

a RESEARCH?

nur ein Pedant zum Objekt einer besonderen Forschung wählen

sollte?

SUCH A RADICAL POINT OF VIEW WAS REPRESENTED

Ein so radikaler Standpunkt wurde von einem grossen Psy-

BY THE FAMOUS AMERICAN PSYCHOLOGIST JAMES GIBSON

chologen, unserem lieben verstorbenen Freund James Gibson vertreten.

* Beispiel; ~~von die Konzepte von~~

A DEAR FRIEND OF MINE WHO DIED A YEAR AGO.
Ich war einer anderen Meinung und habe öfters mit ihm, freudlich
WE DISCUSSED SEVERAL TIMES THIS TOPIC.
aber lebhaft diskutiert. Das letzte Mal, wenige Monate vor seinem

Verschieden.

AT MY OPINION THERE IS A SPECIAL REASON
Ich glaube dass ein besonderer Grund besteht um die
TO STRESS THE IMPORTANCE OF PERCEPTUAL ILLUSIONS
Wichtigkeit der Wahrnehmungstäuschungen zu betonen.
I'LL BEGIN WITH STATING BRIEFLY MY THEORETICAL STANDPOINT
Am Anfang hat man die Täuschungen nur deshalb studiert,
AT THE BEGINNING ILLUSIONS HAVE BEEN CONSIDERED *
weil sie Ausnahmen bildeten, in denen unsere Sinnesapparate
AS EXCEPTIONS, WHERE OUR SENSORY APPARATUS DID NOT
nicht richtig funktionierten, so dass sie uns nicht, wie immer,
FUNCTION WELL, AND THEREFORE DID NOT GIVE US, AS THEY
richtige Auskünfte über die Wirklichkeit gaben. Man studierte
ALWAYS DO, TRUE AND TRUSWORTH INFORMATION ABOUT
die Täuschungen eben als Täuschungen, an und für sich, als
THE REAL WORLD. THEY WERE STUDIED, AND ARE STILL
kleine, interessante Probleme. Am Anfang war man sogar überzeugt,
STUDIED AS LITTLE INTERESTING PROBLEMS.
dass uns die Sinnesapparate nie täuschten. Man suchte deshalb

welche höhere Funktionen (Urteile, Gedächtnissbilder) mit den

Gegebenheiten der Sinnesapparate interferierten und die Ursachen

des falschen Wahrnehmungsbildes waren.

[Üblicher Weise hat man die Täuschungen als Ausnahmen

betrachtet, in denen unsere Sinnesapparate oder unsere Wahrnehmungs

prozesse nicht richtig funktionieren, so dass sie uns nicht,

wie sonst immer, richtige Auskünfte über die Wirklichkeit

geben.]

* THE MAIN PART OF THIS SEMINAR WILL CONSIST IN DEMONSTRATING AND DISCUSSING ~~some~~ PERCEPTUAL ILLUSIONS WHICH WILL SERVE TO ILLUSTRATE THE THEORY.

IT IS HOWEVER POSSIBLE TO CONSIDER THE PERCEPTUAL

Problem der Wahrnehmungstäuschungen in einer ganz anderen Weise

betrachten. Nach diesem Standpunkt sind die W.T. eine Art

ILLUSIONS IN A ~~QUI~~ QUITE DIFFERENT WAY. ACCORDING TO THIS POINT OF VIEW THEY ARE CONSIDERED ALARM SIGNALS, BREAKS IN THE CUIRASS OF OUR NAIVE REALISM. THROUGH WHICH THROUGH WHICH THE DIFFERENCE BETWEEN PERCEPTUAL AN REAL BECOMES DIRECTLY VISIBLE.

Alarmsignale, Zeichen von Maschenauflösungen, Brüche in der Panzer unseres naiven Realismus, durch die man die Verschiedenheit von Phänomenalen und Realen direkt begreift. Und die Funktion der Wahrnemungstäuschungen ist, uns zu zwingen, ein Problem zu sehen, ~~dass~~ wo früher kein Problem zu bestehen schien.

THE VERY FUNCTION OF PERCEPTUAL ILLUSIONS IS TO FORCE US TO SEE A PROBLEM WHERE BEFORE THERE SEEMED TO BE NO PROBLEM.

IT HAS BEEN ALWAYS VERY INTERESTING FOR ME TO ASCERTAIN THAT NOT ONLY THE LAYMEN, THE ORDINARY MEN BUT ALSO THE SPECIALISTS, WHO ARE CONVINCED OF THE DIFFERENCE BETWEEN PERCEPTUAL AN REAL, ~~FAKE~~ GO UP, IN THEIR COMMON LIFE AND BEHAVIOR, TO NAIVE REALISM IN ~~THE~~ A PERFECTLY NATURAL WAY: WHAT I SEE IS A CAR AND NOT MY PERCEPTION OF A CAR.

Es ist ~~scheinbar~~ notwendig für uns die Unterscheidung zwischen Wahrnehmungswelt und Realität (Koffka's behavioral und geographical Environment) zu ignorieren oder wenigstens zu vernachlässigen. Wir haben eine typische Weise, uns zu verteidigen, und das Realismus aufrecht zu erhalten.

um normaler Weise zu leben

IT IS APPARENTLY NECESSARY, IN ORDER TO LIVE A NORMAL LIFE, TO IGNORE OR AT LEAST TO DISREGARD THE DIFFERENCE BETWEEN ~~TH~~ PERCEPTUAL WORLD AND REALITY (BEHAVIORAL AND GEOGRAPHICAL ENVIRONMENT ACCORDING TO KOFFKA)

Wenn wir auf einer Stufe stolpern, sagen wir ganz einfach dass wir die Stufe nicht gesehen oder nicht bemerkt haben. Und dasselbe sagen wir im tragischen Fall, dass wir mit dem Auto einen Radfahrer überfahren. ~~Das~~ bedeutet ganz einfach dass die Stufe, oder der Radfahrer in unserer Wahrnehmungswelt nicht existierte. Wir meinen aber, dass wir den betreffenden Gegenstand hätten sehen können, wenn wir nur unsere Blickrichtung geändert oder unsere Aufmerksamkeit konzentriert hätten. Was wir in diesen Fällen meinen ist das das Apparat richtig funktionierte, und wir es nicht richtig gebraucht haben.

Nach der vorher geschilderten Unterscheidung zwischen W.W. u. Realität

Es gibt aber Fälle, gerade die Wahrnehmungstäuschungen, wo Blickrichtung und Aufmerksamkeit nicht helfen, um was wirklich dabei ist, wahrzunehmen. Wann wir an das Wertheimer-Metzger'sche Ganzfeldphänomen denken, da gibt es kein Ausweg, keine Weg-erkärung. Vor uns steht eine Wand, un wir sehen Nebel; und das Phänomen besteht, so viel wir auch unsere Aufmerksamkeit konzentrieren. Dann gerät das naive Realismus in eine Krise. Man muss erklären warum, obwohl die Wand vor uns steht, wir sie nicht sehen.

Zuerst ist man geneigt die Lösung der Täuschung als spezielles, begrenzted Phänomen an erforschen. Die Frage lautet: warum hat in jenem besonderen Fall das Wahrehmungsapparat, das in der Regel eine treue Reproduktion der Realität wiedergibt, nicht regelmässig funktioniert?

Dieser Weg für jede W.T. gefolgt

So wird für jede Wahrnehmungstäuschung eine verschiedene Lösung gefunden. Es ist wie eine Maber wo ein Stück vom Mörtelüberzug gefallen ist. Man reparierd es, so dass die Farbe homogen ist und kein Fehler mehr, wenigstens für den oberflachlichen Beobacher, zu sehen ist. Das selbe kann ein zweites, ein drittes Mal und noch öfters vorkommen. Aber früher

oder später fällt der ganze Mortelüberzug hinunter und mit grossen Überraschung und Freude entdeckt man, das unter dem Überzug ein Fresko verborgen war.

So was geschieht, früher oder später, wenn man eine Wahrnehmungstäuschung untersucht. Kehren wir zur Ganzfeld erscheinung zurück. Zuerst fragt man sich warum man im diesem Falle die Wand nicht sieht. Aber auf einmal leuchtet es ein dass das nur ein Teilproblem ist erweitert sich das Problem. Man fragt sich nicht nur unter welchen Bedingungen man Nebel, statt einer Wand, wahrnehmt, sondern auch unter welchen Bedingungen man eine Wand sieht wenn eine Wand sich wirklich vor uns befindet. Wieso sieht man in diesem Fall die Farbe an einer Oberfläche kondensiert, und vor dieser Oberfläche den farblosen durchsichtigen Raum? ? Und warum soll das Problem nur die Wand betreffen? ~~Warum~~ Unter welchen Bedingungen sehen wir eine Sessel, ein Pult, ein Buch wenn diese Gegenstände vor uns liegen?

In diesem Sinne sind sie Wahrnehmungstäuschungen kostbare Anzeichen, die uns helfen oder sogar zwingen ein Problem zu erkennen wo gewönlich kein Problem zu bestehen scheint und alles sich als natürlich bietet. In diesem Sinne haben die Wahrnemungstäuschungen zur

Geburt der Wahrnehmungspsychologie beigetragen, und haben uns Wahrnehmungspsychologen überzeugt (ich glaube wenigstens die meisten von uns) dass die Wahrnehmungswelt - die einzige Welt mit der wir in direktem Kontakt sind - all eine Gesamtheit von Problemen, ist, die entdeckt werden müssen (und das ist eine ernste, nicht übersehbare Schwierigkeit) bevor man sie zu lösen anfängt.

Mit diesem ~~Abschluss~~ Behauptung ist der theoretische Teil meines Vortrags zu Ende. Nun möchte ich versuchen aus einigen Untersuchungen über Wahrnehmungstäuschungen - die von meiner Forschungsgruppe stammen ~~worden~~ - die Entwicklung jedes Problems nach dem vorher gesagten folgen , nämlich zeigen wie aus einem beschränkten, speziellen Problem sich eine allgemeinere Problematik entwickelt.

Das erste Beispiel betrifft die Durchsichtigkeitswahrnehmung, ein Gegenstand dem ich mich sehr lange gewidmet habe.

Wenn ich sage, dass meine experimentelle Forschung die Durchsichtigkeitphänomene betrifft, hat man mir oft erstaunt eingewändet: Wieso kann ein Psychologe die Durchsichtigkeit erforschen? Die Durchsichtigkeit ist ja ein physikalisches Phänomen. Ein Ding oder ein Medium ist durchsichtig wenn es die Lichtstrahlen durchkommen lässt; es kann sämtliche Strahlen durchgehen lassen, oder einen Teil aufzehren, oder nur gewisse Wellenlängen durchlassen. Was ich nicht einsehen kann, ist wo man, in diesem Gebiet, ein Wahrnehmungs Problem vorfindet, das sich von den üblichen Problemen der Gesichs Wahrnemnung unterscheidet.

Ich denke, dass mehere meiner Zuhorer diesen Standpunkt teilen. Ich glaube, dass eine sehr einfache Demonstration der beste Weg ist, sie zu überzengen dass die Durchsichtigkeit ein echtes Wahrnehmungsproblem ist das beste is, sie zu überzeugen.

— Versuch —

Sieht jemand etwas durchsichtiges hier? und hier? — Versuch —

Und doch ist die rote Schicht eine physikalisch durchsichtige Plastik, während hier nur ein Mosaik undurchsichtiger verscieder farbiger Pappenstücke ist.

Man ist also berechtigt davon zu schlessen dass die physikalische Durchsichtigkeit weder eine ausreichende noch eine notwendige Bedingung der Durchsichtigkeits Wahrnehmung ist.

Hier hat sich gezeigt dass eine Täuschung ein Mittel sein kann

zu bewesen dass das naive Realismus falsche Schlüsse erzwingen ~~kann~~, und Wahrnehmensprobleme tarnen kann. — Vorlagen —

Ich will noch einen Schritt machen. Hier sieht man ~~Ich will noch~~ eine undurchsichtige, rötliche Figur (das wissen hat ja im Allgemeinen keinen Einfluss auf die Wahrnehmung), und hier auch. Wenn man aber die zwei Vorlagen zusammen stellt, werden auf einmal die resultierende ~~un~~einheitliche Figur durchsichtig.

Was können wir daraus schliessen? Dass die D.W. von der Durchsichtigkeitswahrnehmung Wirkung einer Komplexeen Reizung auf unsere Netzhaut abhängt. Man ist berechtigh (meiner Meinung nach) von einem Feld- oder Gestaltphänomen zu sprechen.

Die Täuschung ist in diesem Fall auch ein Mittel, das Phänomen zu erforschen. Man braucht nur, wie meine Mitarbeiter und ich gemacht haben, die Form und die Farben der Vorlage systhematisch zu ändern, um die notwengigen Bedingungen der D.W. zu entdecken.

Wir sind aber vielleicht von unsern ~~xxxxxx~~ ursprünglichen Thema entgeisst. Ich wollte Ihnen, mit diesem Beispiel zeigen, dass die Analyse einer Täuschung ~~von~~ zu einer Umkehrung des Gesichts~~punktes~~ führen kann, so dass nicht die Täuschung, sondern das ganze Gebiet, ~~auch und~~, und besonders, die Wirklichkeitstreuen Wahrnehmungen zum Problem werden.

Revedere

Zu diesem Zweck geht man am besten von dem begrenzten Problem der Täuschung (in diesem Falle der Durchsichtigkeitstäuschung) aus. Warum täuscht uns diese Figur? Man kann von der üblichen Hypothese ausgehen, dass es ein Erfahrungseffekt ist. Wir ~~xxxx~~ wollen aber nicht diesen aussichtlosen Weg folgen. ~~Vielleicht~~ Wieder gesagt beginnt man ~~kann man experimentieren~~, die Form und die Farben systhematisch zu ändern, um die notwendigen Bedingungen der Täuschung zu entdecken. Auf einmal aber wird es dem Forscher klar, dass die notwendigen Bedingungen nicht nur für die Täuschung, für den Fall der scheinbaren Durchsichtigkeit gelten, sondern auch für den Fall der physikalischen Durchsichtigkeit. Und dann studiert man die Durchsichtigkeits Wahrehmung abgesehen vom nebensachlichem Problem, ob es sich um die wirkliche oder die scheinbare Durchsichtigkeit handelt.

Ich will Ihnen ein anderes Wahrnehmungseffekt zeigen.

– Vorlage –

Wollen sie so höflich sein, ganz einfach zu beschreiben was Sie sehen?

Sehen auch die anderen Damen und Herren das selbe?

Es handelt sich auch hier um eine Wahrnehmungs Täuschung die ich Scheinruhe genannt habe.

Ich glaubte das Effekt entdeckt zu haben, aber ~~das Effekt~~ wurde vor mir von Werner beobachtet und vor Werner von Wittmann in Jahre 1920.

Beide Wissenschaftler beobachtiten das Phänomen an der Maxwellschen Scheibe. Als die Scheibe noch nicht schnell dreht, so dass man noch nicht die Vorstufen der Schmelzung beobachtet, oder wenn sie langsam dreht weil man den Strom ausgeschaltet hat, ~~xxxxxxxxx~~ sieht man ein Sektor auf einer ruheander einfärbiger Scheibe drehen.

Aber, während sowohl Wittmann wie Werner an den Bedingungen der Maxwellschen Scheibe stecken geblieben sind, habe ich alle alle Veranderlichen (Form, Farbe, u.s.w.) und bin zum Schluss gekommen, dass die einzige notwendige Bedingung des Phänomens war dass mindestens ein Teil der Kontur der Bahn den Bewegung entsprache. Bisher scheint es sich nur un die Erforschung eines Kursiosum zu handeln. Tatsachlich habe ich mich zuerst- Es war einer der ersten Veröffentlichungen beschränkt das Problem

in dieser begrenzten Weise zu erforschen. Ich hatte aber den Eindruck dass mir das Wesen des Problems entgangen war.

In diesem Fall kann man, in der historischen Entwicklung der Forschung, drei verschiedene Stufen Unterscheiden. Die ~~xxx~~ erste, bisher beschriebene Stufe, ist die Begrenzte Erforschung der Täuschung, um deren notwendige Bedingungen zu ermitteln.

Nach vielen Jahren (15) dünkte es mir, dass eine Betrachtung des Effektes am ~~xxxxxx~~ Niveau der proximalen Reizung, neue Einsicht (neues Licht) dem Problem bringen könnte.

Welche Änderingen in der proximaler Reizung werden von den verschiedenen Änderungen an der Verlage verursacht? Das kann als die zweite Stufe der Forschung gelten, und hier auf einmal die grosse Überraschung. Die Täuschende Vorlage, die Scheinruhe verursacht, und eine übereinstimmende Korrespondere~~ck~~ Vorlage, die die echte Ruhe der Korresponderunden Teile der Vorlage verwirklibht verursachen die selbe Reizung. — Vorlage —

Die Täuschende Vorlage reproduziert die Reizung einer nicht tauschenden Vorlage. Die Täuschung stellt, wie kein Problem; unser Problem ist ganz einfach verschwunden.

Doch bleibt etwas zu erklären. Warum sehen wir - im Falle der Täuschenden sowie im Falle der nicht täuschenden Vorlage - einen Rechteck, der auf einem ruhenden Kreis rotiert, und nicht einen Halbkreis der zusammen mit dem Rechteck rotiert?

Hier beginnt die dritte Stufe: die euristische Funktion der Täuschung wird klar. Das Problem hat sich erweitet es betrifft nicht mehr nur die Täuschung, sondern auch die Fälle in denen keine Täuschung stattfindet, wo die Wahrnehmung uns eine treue Wiedergabe der Vorlage verschafft.

Ich glaube dass man ein Lösung finden kann, wenn man (das Problem erweitert und) sich fragt was auf der Netzhaut stattfindet wenn sich ein Gegenstand vor einem Grund bewegt.

Denken wir an den vereinfachten Fall der Bewegung einer farbhomogenen Figur auf einem andersfärbigen homogenen Grund. Auf der Netzhaut haben wir eine homogen gereizte Fläche, die von einer Seite wächst und von der anderen schrumpft. Im Falle unseres Beispiels geschieht das für den Halbkreis sowie für den Rechteck. ~~Aber für die Kontur - die Rechteck,~~ Aber für betreffend die Kontur - die Region wo sich die Reizung sprungweise verändert - geschieht etwas verschiedenes für den Rechteck und für den Halbkreis.

In dieser Beziehung ist es erforderlich, zwischen zwei verschiedenen Arten Ränder zu unterscheiden. Es gibt Ränder die der Bahn eines Punktes antsprechen. Wenn eine farbhomogene Figur nur Ränder dieser Art hat (z.B. ein rotierender Kreis), bewirkt die Bewegung keine Reizänderung an der Netzhaut. In diesem Fall wird die Figur, obwohl sie sich bewegt, als ruhend Wahrgenommen. Deshalb werden wir diese Art Ränder, "Kinetisch unwirksam" nennen. Alle andere Ränder, die durch die Bewegung eine Reizanderung an der Retina verursachen, nennen wir kinetisch wirksam. Es leuchtet aber gleich ein, dass in diesem Fall, da am Niveau der Netzhaut keine Änderung statt findet, man zwischen einem bewegten und einem ruhenden Gegenstand nicht unterscheiden kann. Was geschieht aber im Falle unserer Vorlage, die nur Teilweise Kinetisch unwirksame Ränder hat? Hier verhalten sich die Ränder am Niveau der Netzhaut wieder in verschiedener Weise: die Kinetisch wirksamen Rander verlagern sich, während die Kinetisch unwirksamen Ränder wachsen von einer Seite und Schrumpfen von der andern. Die selbe Beschreibung gilt aber auch, wenn di Vorlage aus einem Rechteck besteht der sich auf einer

ruhenden scheibe bewegt. So kann man als kinetisch unwirksam alle Ränder betrachten die entweder keine Änderung am Niveau der Netzhaut bewirken, oder wachsen von einer Seite und schrumpfen von einer anderen. Und das gilt wieder auch für alle ruhenden Gegenstände, deren Ränder deshalb der Klasse der Kinetisch unwirksamen gehören.

Wie können wir, von dem Charakter der Grenzen ausgehend das Abbrechen unserer Vorlage in einem ruhenden Kreis und einem rotierenden Rechteck beschreiben? Ganz einfach: Durch die Bewegung entstehen zwei Gebilde, dessen jedes Kinetisch homogene Ränder besitzt. Man kann durch naheliegende Experimente feststellen, welche Resultate man unter verschiedenen Bedingungen erhält.

Aber hier interessiert uns das erweiterte Problem. Wir haben eine Tendenz zur Kinetischen Homogenität der Ränder festgestellt. Was geschieht wenn sich ein Gegenstand bewegt in einem Felde das von verschiedenen unregelmässingen und auf einander gelegten Dingen besetzt ist? Auch in diesem Fall können wir zwischen Ränder die entweder keine Änderung an Niveau der Netzhaut bewirken, oder sich ausdehnem und schrumpfen, und andere, die Kinetisch

Wirksamen, die sich verlagern. Es ist seit langem bekannt dass die physikalische Bewegung nicht als Reiz für die Bewegungswahrnehmung wirken kann. Deshalb betrachten wir was am Niveau der Netzhaut verkommt. Die Bewegung des Gegenstandes bewirkt ein Wachsen und Schrumpfen mehrerer verschieden gereizter Flächen (am Sinnesorgan) ~~bleiben ständig~~ Die Grenzen zwischen den verschieden gereizten Flächen bleiben ständig oder wachsen und schrumpfen (auch die Konturen der ruhenden Dingen, die von dem bewegten Ding zeitlich gedeckt werden, wachsen und schrumpfen). Aber die Konturen des bewegten Dinges sind die einzigen die sich (ausgenommen der sehr seltenen Fall der Korrespondenz eines Teiles mit der Traiektorie des Dinges) verlagern. Und wegen der Tendenz zur kinetischen Homogenität der Randes, gehören sie zusammen und tragen der Einheit des Dinges bei. So, anstatt einer kaleidoskopischen Aenderung von wachsender und schrumpfender Gestalten, nimmt man ein Ding, das sich inmitten ruhender Dingen bewegt, wahr.

So sind wir, von einer Wahrnehmungstäuschung ausgehend, zu einem Beitrag zur Optischen Bewegungwahrnehmungslehre gelangen.

Ich will Ihnen noch eine dritte Täuschung demonstrieren und wenn möglich kurz erörtern.

Was sehen Sie?

Wollen sie sich bitte der Vorlage nähern?

Noch näher, bitte

Nun wollen Sie ~~xxxx~~ mit dem Zeigefinger das linke Quadrat berühren?

Wir sehen also eine Oberfläche Wo tatsächlich ein Loch ist. Man könnte sagen, dass, was man in diesem Fall wahrnemmt das Gegenteil des Ganzfeldphänomens ist; beim Ganzfeld sieht man nicht eine Oberfläche, die man vor den Augen hat, während in unserem Fall man eine Oberfläche whrnimmt die in der Vorlage fehlt.

Man hat natürlich alle Bedingungen des Phänomens wariert. Die einzige "conditio sine qua non" um das Effekt zu erzeugen ist die Homogenität der Fläche die sich hinter dem Loch befindet. Wenn die genamte Oberfläch strukturiert ist oder inhomogen ist (es braucht auch nur ein Halbschatten darüber zu fallen) verschwindet die Tauschung - man sieht ein Loch, und dadurch, in einem gewissen Abstand, eine Oberfläche. Die Erklärung des Phänomens liegt bei. Ein Loch ist eine Erscheinung die sich gegen das Gesetz der einseitingen Wirkung der Kontur durchsetzte~~n~~.

Wenn keine andere Bedingungen dagegen wirken, gohört die Kontur der inneren und nicht der äusseren Region und es entsteht eine Figur, die auf ~~ihrem~~ einem Grund liegt. Wenn wir das Problem vom Standpunkt der proximalen Reizung betrachten wollen, stellt es sich aus, dass im Falle des Loches mit homogenem Hintergrund und im Falle eines dünnen homogen gafärbten Papierstückes das auf einem andersfärbigen Grunde geklebt ist, die Reizung identisch ist. Wenn aber der Grund hinter dem Loch und das Stück Papier inhomogen sind (z.B. Mosaikartig sind oder irgend eine Zeichnung drauf haben) dann ist die Reizung nicht mehr dieselbe, da im Falle des Loches die Reizung in den zwei Netzhauten verschieden ist, und deshalb eine dreidimensionelle Wahrnehmung stattfindet.

Ich muss gestehen dass ich bisher noch nicht im Stande bin, den dritten Schritt zu machen, und die Wichtigkeit der Erscheinung für die optische Raumwahrenehmung zu zeigen. (Hoffentlich würden wir in diesem Fall nicht 15 Jahre brauchen um das Problem zu erweitern.

Es ist aber vielleicht interessant ~~meine~~ die Schilderung zu ergänzen, und erzählen, dass eine Mitarbeiterin von mir,

Dr. Cavedon, im Stande gewesen ist, die gegenteilige Täuschung zu realisieren: unter gewissen Unständen sehen die Versuchspersonen ein Loch wo kein Loch ist. Leider ist in diesem Fall die Demonstration ein wenig Komplizierter und ich war nicht im Stande ohne der Hilfe von Frau Cavedon sie aufzustetten. Andere interessante Beobachtungen wurden in Bezug auf das Lochproblem gemacht. So z.B. einem jungen Professor unserer Arbeitsgruppe sind wir folgender Beobachtung schuldig: wenn der Unterschied der Albedo angrenzeuder Flächen sehr klein ist, entsteht eine Art Nebel vor dem Gebilde. Und wieder eine interessnte Ausnahme im Falle des Lochproblems : wenn das Loch tief schwarz ist (was man mit einer mit schwarzem Samt gefütterten Schachtel, dicht hinter dem Loch erhält) sieht man immer ein Loch.

Die Bedeutung der Wahrnehmungstäuschungen für die Theorie und die Forschung

Die Funktion der Wahrnehmungstäuschungen in der Forschung

Mein Vortrag betrifft die Wahrnehmungstäuschungen. Es ist deshalb vielleicht angemessen mit einer Definition anzufangen. Nach einem berühmten Spezialisten dises Gebietes, Professor Edwin Rausch ist von Täuschung zu sprechen sofern die Verhältnisse (~~die metrischen Verhältnisse im Falle der Geometrisch-optischen Täuschungen~~) der wahrgenommenen Konfiguration sich von den zugehörigen Verhältnissen der Vorlagekonfiguration unterscheiden. Hier verde ich aber nicht von geometrisch-optischen Täuschungen sprechen, sondern von Wahrnehmungstäuschungen im weiteren Sinne.

Da wir nun das Gegenstandsgebiet festgestellt haben, kommt fast von-sich-selbst eine natürliche Frage. Warum haben die Wahrnehmungstäuschungen einen besonderen Platz in jedem Handbuch der Psychologie? Sind sie wirklich so bedeutend, oder handelt es sich schliesslich um unwichtige kleine Probleme die nur ein Pedant zum Objekt einer besonderen Forschung wählen sollte?

Ein so radikaler Standpunkt wurde von einem grossen Psychologen, unserem lieben verstorbenen Freund James Gibson vertreten. Ich war einer anderen Meinung und habe öfters mit ihm, freudlich aber lebhaft diskutiert. Das letzte Mal, wenige Monate vor seinem Verschieden.

Ich glaube dass ein besonderer Grund besteht die Wichtigkeit der Wahrnehmungstäuschungen zu betonen.

Am Anfang hat man die Täuschungen nur deshalb studiert, weil sie Ausnahmen bildeten, in denen unsere Sinnesapparate nicht richtig funktionierten, so dass sie uns nicht, wie immer, richtige Auskünfte über die Wirklichkeit gaben. Man studierte die Täuschungen eben als Täuschungen, an und für sich, als kleine, interessante Probleme. ~~Am Anfang war~~ Man war sogar überzeugt, dass uns die Sinnesapparate nie täuschten. Man versuchte deshalb welche höhere Funktionen (Urteile, Gedächtnissbilder) mit den Gegebenheiten der Sinnesapparate interferierten und die Ursachen des falschen Wahrnehmungsbildes waren.

~~Üblicher Weise hat man~~ Man hat also die Täuscnungen als Ausnahmen betrachtet, in denen unsere Sinnesapparate oder unsere Wahrnehmungsprozesse nicht richtig funktionieren, ~~so dass sie uns nicht, wie sonst immer, richtige Auskünfte über die Wirklichkeit geben~~. Doch kann man das Problem der Wahrnehmungstäuschungen in einer ganz anderer Weise betrachten. Nach diesem Standpunkt sind die W.T. eine Art Alarmsignale, Zeichen von Maschenauslösungen, Brüche in dem Panzer unseres naiven Realismus, durch die man die Verschiedenheit von Phänomenalen und Realen direkt begreift. Und die Funktion der Wahrnehmungstäuschungen ist, uns zu zwingen, ein Problem zu sehen, wo früher kein Problem zu bestehen schien.

Es ist für mich immer interessant gewesen, zu bemerken dass nicht nur die Laien, sondern auch die Sachverständige, die von der Verschiedenheit des phänomenalen vom realen (Milieu) überzeugt sind, im gewöhnlichen Leben und Verhalten das Denken des naiven Realisten natürlischer Weise übernehmen. Es ist scheinbar notwendig für uns im praktischen Leben die Unterscheidung zwischen Wahrnehmungs

welt und Realität (Koffka's "behavioral" und "geographical" Environment) zu ignorieren oder weigstens zu vernachlässigen.

Wir haben eine typische Weise, uns zu verteidigen, und ~~das~~ den Realismus ~~an~~aufrecht zu erhalten. Wenn wir ~~auf~~ über einer Stufe stolpern, sagen wir ganz einfach dass wir die Stufe nicht gesehen oder nicht bemerkt haben. Und dasselbe sagen wir im tragischen Fall, dass ~~wir~~ man mit dem Auto einen Radfahrer überfahren hat. Das bedeutet ganz einfach dass die Stufe, oder der Radfahrer in unserer Wahrnehmungswelt nicht existierte. Wir meinen aber, dass wir den betreffenden Gegenstand hätten sehen können, wenn wir nur unsere Blickrichtung geändert oder unsere Aufmerksamkeit konzentriert hätten. Was wir in diesen Fällen meinen, ist dass ~~das~~ der Apparat richtig funktionnierte, und wir ~~es~~ ihn nicht richtig gebraucht haben.

Es gibt aber Fälle, gerade die Wahrnehmungstäuschungen, wo Blickrichtung und Aufmerksamkeit nicht helfen, um, was wirklich dabei ist, wahrzunehmen. Wenn wir an das Wertheimer Metzger'sche Ganzfeldphänomen denken, da gibt es kein Auswe~~g~~ssen, keine Weg-erkärung. Vor uns steht eine Wand, und wir sehen Nebel; und das Phänomen besteht, so viel wir auch unsere Aufmerksamkeit konzentrieren. Dann gerät ~~dan~~ der naive Realismus in eine Krise. Man muss erklären warum, obwohl die Wand vor uns steht, wir sie nicht sehen.

Zuerst ist man geneigt die Lösung der Täuschung als spezielles, begrenzte~~d~~s Phänomen ~~an~~ zu erforschen. Die Frage lautet:

DER

warum hat in jenem besonderen Fall der Wahrnehmungsapparat, der in der Regel eine treue Reproduktion der Realität wiedergibt, nicht regelmässig funktioniert?

So wird für jede Wahrnehmungstäuschung eine verschiedene Lösung gefunden. Ich möchte mich in einer bildlichen Weise ausdrücken Es ist wie eine Mauer wo ein Stück vom Mörtelüberzug gefallen ist. Man reparierd sie, so dass die Farbe homogen ist und kein Fehler mehr, wenigstens für den oberflachlichen Beobachter, zu sehen ist. Das selbe kann ein zweites, ein drittes Mal und noch öfters vorkommen. Aber früher oder später fällt der ganze Mörtelüberzug hinunter und mit grosser Überraschung und Freude entdeckt man, das unter dem Überzug ein Fresko verborgen war.

So was geschieht, früher oder später, wenn man eine Wahrnehmungstäuschung untersucht. Kehren wir zur Ganzfelderscheinung zurück. Zuerst fragt man sich warum man im diesem Falle die Wand nicht sieht. Aber auf einmal erweitert sich das Problem. Man fragt sich nicht nur unter welchen Bedingungen man Nebel, statt einer Wand, wahrnimmt, sondern auch unter welchen Bedingungen man eine Wand sieht wenn eine Wand sich wirklich vor uns befindet. Wieso sieht man in diesem Fall die Farbe an einer Oberfläche kondensiert, und vor dieser Oberfläche den farblosen durchsichtigen Raum? Und warum soll das Problem nur die Wand betreffen? Unter welchen Bedingungen sehen wir einen Sessel, ein Pult, ein Buch wenn diese Gegenstände vor uns liegen?

In diesem Sinne sind die Wahrnehmungstäuschungen kostbare Anzeichen, die uns zwingen ein Problem zu erkennen wo gewönlich

ZWINGEN

kein Problem zu bestehen scheint und alles sich als natürlich bietet. In diesem Sinne haben die Wahrnehmungstäuschungen zur Geburt der Wahrnehmungspsychologie beigetragen, und haben uns Wahrnehmungspsychologen überzeugt (ich glaube wenigstens die meisten von uns) dass die Wahrnehmungswelt - die einzige Welt mit der wir in direktem Kontakt sind - all eine Gesamtheit von Problemen ist, die entdeckt werden müssen (und das ist eine ernste, nicht übersehebare Schwierigkeit) bevor man sie zu lösen anfängt.

Mit dieser Behauptung ist der theoretische Teil meines Vortrags zu Ende. Nun möchte ich versuchen aus einigen Untersuchungen über Wahrnehmungstäuschungen - die von meiner Forschungsgruppe stammen - die Entwicklung ~~jedes~~ des Problems nach dem vorher gesagten zu folgen, nämlich zeigen wie aus einem beschränkten, speziellen Problem sich eine allgemeinere Problematik entwickelt.

~~Das erste~~ Mein erstes Beispiel betrifft die Durchsichtigkeitswahrnehmung, ein Gegenstand dem ich mich sehr lange gewidmet habe.

Wenn ich sage, dass meine experimentelle Forschung die Durchsichtigkeitphänomene betrifft, hat man mir oft erstaunt eingewändet: "Wieso kann ein Psychologe die Durchsichtigkeit erforschen? Die Durchsichtigkeit ist ja ein physikalisches Phänomen. Ein Ding oder ein Medium ist durchsichtig wenn es die Lichtstrahlen durchkommen lässt; es kann sämtliche Strahlen durchgehen lassen, oder einen Teil einsaugen, oder nur gewisse Wellenlängen durchlassen. Was ich nicht einsehen kann, ist wo man, in diesem Gebiet, ein Wahrnehmungs Problem vorfindet, das sich von den üblichen Problemen der Gesichswahrnehmung unterscheidet.

Ich denke, dass mehere meiner Zuhörer diesen Standpunkt teilen. Ich glaube, dass eine sehr einfacher Demonstration der beste Weg ist, sie zu überzeugen dass die Durchsichtigkeit ein echtes Wahrnehmungsproblem ist.

- Vorlage 1 - 2

Sieht jemand etwas durchsichtiges hier? und hier?
- Vorlage - Und doch ist die rote Schicht eine physikalische durchsichtige Plastik, während hier nur ein Mosaik undurchsichtiger verschieden-farbiger Pappenstücke ist.

a) Man ist also berechtigt daraus zu schliessen dass die physikalische Durchsichtigkeit weder eine ausreichende noch eine notwendige Bedingung der Durchsichtigkeitswahrnehmung ist.

Hier hat sich gezeigt dass eine Täuschung ein Mittel sein kann zu beweisen dass der naive Realismus falsche Schlüsse erzwingen und Wahrnehmungsprobleme tarnen kann. - Vorlage -

b) Ich will noch einen Schritt machen. Hier sieht man eine undurchsichtige, rötliche Figur (das Wissen hat ja im Allgemeinen keinen Einfluss auf die Wahrnehmung), und hier auch. Wenn man aber die zwei Vorlagen zusammen stellt, wird auf einmal die resultierende einheitliche Figur durchsichtig.

Was können wir daraus schliessen? Dass die Durchsichtigkeitswahrnehmung von der Wirkung einer Komplexeen Reizung auf unsere Netzhaut abhängt. Man ist berechtigh (meiner Meinung nach) von einem Feld - oder Gestaltphänomen zu sprechen.

c) Die Täuschung ist in diesem Fall auch ein Mittel, das Phänomen zu erforschen. Man braucht nur, wie meine Mitarbeiter und ich gemacht haben, die Form und die Farben der Vorlage systhematisch zu ändern, um die notwendigen Bedingungen der Durchsichtigkeitswahrnehmung zu entdecken.

Wir sind aber vielleicht von unserem ursprünglischen Thema abgekommen entgleisst. Ich wollte Ihnen, mit diesem Beispiel zeigen, dass die Analyse einer Täuschung zu einer Umkehrung des Gesichtspunktes führen kann, so dass nicht die Täuschung, sondern das ganze Gebiet, und besonders, die Wirklichkeitstreuen Wahrnehmungen zum Problem werden.

Zu diesem Zweck geht man am besten von einem (dem) begrenzten Problem der Täuschung (in diesem Falle der Durchsichtigkeitstäuschung) aus. Warum täuscht uns diese Figur? Man kann von der üblichen Hypothese ausgehen, dass es ein Erfahrungseffekt ist. Wir wollen aber nicht diesen Aussichtlosen Weg folgen. Wie oben gesagt, beginnt man, die Form und die Farben systhematisch zu

a) ändern, um die notwendigen Bedingungen der Täuschung zu entdecken. Auf einmal aber wird es dem Forscher klar, dass die notwendigen Bedingungen nicht nur für die Täuschung, für den Fall der scheinbaren Durchsichtigkeit gelten, sondern auch für den Fall der physikalischen Durchsichtigkeit. Und dann studiert man die Durchsichtigkeits-Wahrnehmung abgesehen vom nebensachlichem Problem, ob es sich um die wirkliche oder die scheinbare Durchsichtigkeit handelt.

Ich will Ihnen ein anderes Wahrnehmungseffekt zeigen.

- Vorlage -
Scheinruhe

Wollen sie so ~~höflich~~ freundlich sein, ganz einfach zu beschreiben was Sie sehen?

Sehen auch die anderen Damen und Herren das selbe?

Es handelt sich auch hier um eine Wahrnehmungstäuschung die ich Scheinruhe genannt habe.

Ich glaubte den Effekt entdeckt zu haben, aber er wurde vor mir von ~~Werner~~ Wittmann (1920) Werner (1928) beobachtet und vor Werner von Wittmann in Jahre 192~~8~~. (Richtung der Aufmerksamkeit)

Beide Wissenschaftler beobachteten das Phänomen an der Maxwellschen Scheibe. ~~Als~~ Wenn die Scheibe noch nicht schnell dreht, so dass man noch nicht die Vorstufen der Schmelzung beobachtet, oder wenn sie langsam dreht weil man den Strom ausgeschltet hat, sieht man ein Sektor auf einer ruhenden einfärbigen Scheibe sich drehen.

ich Stereokinese

1 Aber, während sowohl Wittmann wie Werner an den Bedingungen der Maxwellschen Scheibe stecken geblieben sind, habe ich alle ~~alle Veranderlichen~~ Variablen systematisch verändert (Form, Farbe, u.s.w.) und bin zum Schluss gekommen, dass die einzige notwendige Bedingung des Phänomens war, dass mindestens ein Teil der Kontur der Bahn der Bewegung entsprach. (Bewegung - auch geradlinig)

alle Variablen verändert

man kann deshalb eine einfachere Vorlage benutzen wo man das selbe Phänomen, wenn auch in einer weniger zwingenden Form, beobachten kann

~~Bisher scheint es sich nur um die Erforschung eines Kur~~ ~~Widerum zu handeln. Tatsachlich~~ Ich habe ~~ich~~ mich zuerst - es war eine ~~der~~ meiner ersten ~~Veröffentlichungen~~ Forschungen - beschränkt das Problem in dieser begrenzten Weise zu erforschen. Ich hatte aber den Eindruck dass mir das Wesen des Problems entgangen war.

In diesem Fall kann ~~man~~ ich, in der historischen Entwicklung ~~der~~ meiner Forschung, drei verschiedene Stufen Unterscheiden. Die

× erst eine stabile Form der Täuschung entwickelt (meiner Meinung nach ist der erste Schritt in der Erforschung einer Täuschung die Täuschung ganz deutlich beobachten zu können und dann (eine Form der Täuschung zu erfinden, in der man)

erste, bisher beschriebene Stufe, ist die Begrenzte Erforschung der Täuschung, um deren notwendige Bedingungen zu ermitteln.

2. Schritt. Nach vielen Jahren (15) dünkte es mir, dass eine Betrachtung des Effektes am Niveau der proximalen Reizung, neue Einsicht in das ~~(neues Licht) dem~~ Problem bringen könnte.

Welche Änderungen in der proximalen Reizung - an der Netzhaut - werden von ~~den verschiedenen Änderungen an~~ der Bewegung der Vorlage verursacht? Das kann als die zweite Stufe der Forschung gelten. Und hier auf einmal die grosse Überraschung. (Da habe ich - zu meiner Erstaunung bemerkt, dass die) ~~Die~~ Täuschende Vorlage, die Scheinruhe verursacht, und eine übereinstimmende Vorlage, die echte Ruhe der Korrespondierenden Teile der Vorlage verwirklicht, ~~verursachen~~ verursachen die selbe Reizung. - Vorlage -

Die Täuschende Vorlage reproduziert die Reizung einer nicht täuschenden Vorlage. Die Täuschung stellt also kein Problem: ~~unser~~ das Problem ist ganz einfach verschwunden.

3. Schritt. Doch bleibt etwas zu erklären. Warum sehen wir - im Falle der täuschenden sowie im Falle der nicht täuschenden Vorlage - ein~~en~~ Rechteck, d~~es~~ auf einem ruhenden Kreis rotiert, und nicht einen Halbkreis der zusammen mit dem Rechteck rotiert?

Hier beginnt die dritte Stufe: die heuristische Funktion der Täuschung ~~wird~~ beginnt zu werden klar. Das Problem hat sich erweitert: es betrifft nicht mehr nur die Täuschung, sondern auch ~~die Fälle in denen~~ einen Fall in dem keine Täuschung stattfindet, wo die Wahrnehmung uns eine treue Wiedergabe der Vorlage verschafft.

Ich glaube dass man eine Lösung finden kann, wenn man (das Problem erweitert und) sich fragt was auf der Netzhaut stattfindet

Beginnen wir also mit der Lösung des beschraenkten Problems des Ausein=anderfallens unserer Vorlage in zwei Figuren, einen Kreis und einen Rechteck. Hier sind die Tatsachen sehr komplifiziert; ich werde sie nur in einer vereinfachten Weise vorlegen.

Man soll erstens hervorheben, dass keine Bewegung an der Netzhaut stattfindet. Es gibt nur annaehernd gleich gereizte Flaechen, die sich teilweise aendern, sie wachsen von einer Seite und Schrumpfen ~~von einer~~ an der anderen Seite. Die Raender (die Reizsprünge zwischen zwei verschieden gereizten Flächen) verhalten sich aber anders: manche verlagern sich und manche nicht. Ein einleuchtendes Beispiel ist ein farbhomogener Kreis, der um sein (sein Mittelpunkt) ~~zentrum~~ rotiert. Seine Raender verlagern sich nicht. Die Netzhautprojektion einer solchen Figur verursacht keine Reizaenderung: die Figur wird als ruhig wahrgenommen.

Es ist deshalb angemessen zwischen zwei Arten Raender zu unterschei=den: Kinetisch wirksame und kinetisch unwirksame Raender. Kinetisch wirksam sind die Raender die sich auf der Netzhautprojektion verlagern, waehrend kinetisch unwirksam sind die Raender die sich in der Netzhaut=projektion nicht verlagern.

Nun sind wir im Stande zu analysieren, was im Falle unserer und aehnlicher Vorlagen geschieht: die retinale Projektion unserer Vorlage hat sowohl kinetisch wirksame wie kinetisch unwirksame Raender - sie hat kinetisch unhomogene Raender. Was wir aber wahrnehmen, sind zwei Figuren, von denen jede kinetisch homogene Raender hat, naemlich ~~ein~~ einen Kreis mit kinetisch unwirksamen Raendern, und ein Rechteck mit kinetisch wirksamen Raendern.

Es hat sich also eine Tendenz zur kinetischen Homogenitaet der Raender herausgestellt.

Und nun ein Schritt zur allgemeinen Problematik, zu der unsere Ana=lyse der Täuschung geführt hat.

der Netzhaut bewirken, oder wachsen von einer Seite und schrumpfen von einer anderen. Und das gilt wieder auch für alle ruhenden Gegenstände, deren Ränder deshalb der Klasse der kinetisch unwirksamen gehören.

Wie können wir, von dem Charakter der Grenzen ausgehend das Abbrechen unserer Vorlage in einem ruhenden Kreis und einem rotierenden Rechteck beschreiben? Ganz einfach: Durch die Bewegung entstehen zwei Gebilde, dessen jedes kinetisch homogene Ränder besitzt. Man kann durch naheliegende Experimente feststellen, welche Resultate man unter verschiedenen Bedingungen erhält.

Aber hier interessiert uns das erweiterte Problem. Wir haben eine Tendenz zur kinetischen Homogenität der Ränder festgestellt. Was geschieht wenn sich ein Gegenstand bewegt in einem Felde das von verschiedenen unregelmässingen und auf einander gelegten Dingen besetzt ist? Auch in diesem Fall können wir zwischen Rändern die entweder keine Änderung am Niveau der Netzhaut bewirken, oder sich ausdehnem und schrumpfen, und andere, die kinetisch Wirksamen, die sich verlagern. Es ist seit langem bekannt dass die physikalische Bewegung nicht als Reiz für die Bewegungswahrnehmung wirken kann. Also betrachten wir was am Niveau der Netzhaut verkommt. Die Bewegung des Gegenstandes bewirkt ein Wachsen und Schrumpfen mehrerer verschieden gereizter Flächen am Sinnesorgan. Die Grenzen zwischen den verschieden gereizten Flächen bleiben ständig oder wachsen und schrumpfen (auch die Konturen der ruhenden Dingen, die von dem bewegten Ding zeitlich gedeckt werden, wachsen und schrumpfen). Aber die Konturen des

bewegten Dinges sind die einzigen die sich (ausgenommen den sehr seltenen Fall der Korrespondenz eines Teiles mit der Traiektorie des Dinges) verlagern. Und wegen der Tendenz zur kinetischen Homogenität der Randes, gehören sie zusammen und tragen der Einheit des Dinges bei. So, anstatt einer kaleidoskopischen Aenderung von wachsender und schrumpfender Gestalten, nimmt man ein Ding, das sich inmitten ruhender Dingen bewegt, wahr.

So sind wir, von einer Wahrnehmungstäuschung ausgehend, zu einem Beitrag zur Optischen Bewegungwahrnehmungslehre gelungen.

Ich will Ihnen noch eine dritte Täuschung demonstrieren und wenn möglich kurz erörtern. Vorlage

Was sehen Sie?

Wollen sie sich bitte der Vorlage nähern?

Noch näher, bitte

Nun wollen Sie mit dem Zeigefinger das linke Quadrat berühren?

Wir sehen also eine Oberfläche wo tatsächlich ein Loch ist. Man könnte sagen, dass, was man in diesem Fall wahrnimmt das Gegenteil des Ganzfeldphänomens ist; beim Ganzfeld sieht man nicht eine Oberfläche, die man vor den Augen hat, während in unserem Fall man eine Oberfläche wahrnimmt die in der Vorlage fehlt.

Man hat natürlich alle Bedingungen des Phänomens variiert. Die einzige "conditio sine qua non" um den Effekt zu erzeugen ist die Homogenität der Fläche die sich hinter dem Loch befindet. Wenn die genannte Oberfläche strukturiert ist oder inhomogen ist (es braucht auch nur ein Halbschatten darüber zu fallen)

verschwindet die Tauschung - man sieht ein Loch, und dadurch, in einem gewissen Abstand, eine Oberfläche. Die Erklärung des Phänomens liegt ~~bei~~ nahe. Ein Loch ist eine Erscheinung die sich gegen das Gesetz der einseitingen Wirkung der Kontur durchsetzt. Wenn keine andere Bedingungen dagegen wirken, gehört die Kontur der inneren und nicht der äusseren Region und es entsteht eine Figur, die auf einem Grund liegt. Wenn wir das Problem vom Standpunkt der proximalen Reizung betrachten wollen, stellt es sich ~~aus~~ heraus, dass im Falle des Loches mit homogenem Hintergrund und im Falle eines ~~dünnen~~ homogen gefärbten Papierstückes das auf einem andersfärbigen Grunde geklebt ist, die Reizung identisch ist. Wenn aber der Grund hinter dem Loch und das Stück Papier inhomogen sind (z.B. Mosaikartig sind oder irgend eine Zeichnung darauf haben) dann ist die Reizung nicht mehr dieselbe, da im Falle des Loches die Reizung in den zwei Netzhauten verschieden ist, und deshalb eine dreidimensionelle Wahrnehmung stattfindet.

Ich muss gestehen dass ich bisher noch nicht im Stande bin, den dritten Schritt zu machen, und die Wichtigkeit der Erscheinung für die optische Raumwahrnehmung zu zeigen. (Hoffentlich werden wir in diesem Fall nicht 15 Jahre brauchen um das Problem zu erweitern.

Es ist aber vielleicht interessant die Schilderung zu ergänzen, und erzählen, dass eine Mitarbeiterin von mir, Dr. Cavedon, im Stande gewesen ist, die gegenteilige Täuschung zu realisieren: unter gewissen Unständen sehen die Versuchspersonen ein Loch wo kein Loch ist. Leider ist in diesem Fall die Demonstration ein wenig Komplizierter und ich war nicht im Stande ohne der Hilfe

von Frau Cavedon sie aufzustellen. Andere interessante Beobachtungen wurden in Bezug auf das Lochproblem gemacht. So z.B. einem jungen Professor unserer Arbeitsgruppe ~~sind~~ verdanken wir folgender Beobachtung ~~schuldig~~: wenn der Unterschied der Helligkeit Albedo angrenzeuder Flächen sehr klein ist, entsteht eine Art Nebel vor dem Gebilde. Und wieder eine interessante Ausnahme im Falle des Lochproblems: wenn das Loch tief schwarz ist (was man mit einer mit schwarzem Samt gefütterten Schachtel, dicht hinter dem Loch erhält) sieht man immer ein Loch. und nicht eine Oberfläche: die Farbe ist eine Flächenfarbe im Sinne von Katz.

coercitiv = zwingend, erzwingend

METRIC TABLES

Linear Measure. (Length)

1,000 micrometres	=	1 millimetre (mm)
10 millimetres	=	1 centimetre (cm)
10 centimetres	=	1 decimetre (dm)
10 decimetres	=	1 metre (m)
10 metres	=	1 decametre (dam)
10 decametres	=	1 hectometre (hm)
10 hectometres	=	1 kilometre (km)

Measures of

1,000 microgrammes	=	1 milligramme (mg)
10 milligrammes	=	1 centigramme (cg)
10 centigrammes	=	1 decigramme (dg)
10 decigrammes	=	1 gramme (g)
10 grammes	=	1 decagramme (dag)
10 decagrammes	=	1 hectogramme (hg)
10 hectogrammes	=	1 kilogramme (kg)
1,000 kilogrammes	=	1 tonne

Measures of volume and capacity.

10 millilitres (ml)	=	1 centilitre (cl)
10 centilitres	=	1 decilitre (dl)
10 decilitres	=	1 litre (l)
10 litres	=	1 decalitre (dal)
10 decalitres	=	1 hectolitre (hl)
10 hectolitres	=	1 kilolitre (kl)

Square measure or area.

1 Are	=	100 square metres
1 Decare	=	10 ares
1 Hectare	=	100 ares
1 Deciare	=	1/10 of an are
1 Centiare	=	1/100 of an are
	=	1 square metre

CONVERSION

1 metre	=	39·37 inches
1 litre	=	1·76 pints
1 kilogramme	=	2·2046 pounds
1 hectare	=	2.471 acres
° Centigrade	=	(°F −32) × 5/9

1 inch	=	2·54 centimetres
1 pint	=	0·568 litre
1 pound	=	453·59 grammes
1 acre	=	0·4047 hectares
° Fahrenheit	=	(°C × 9/5) + 32

VOLUME

Cube: l^3, (l = length of one side).
Sphere: $\frac{4}{3}\pi r^3$, (r = radius).
Cylinder: $\pi r^2 l$,
(r = radius, l = length).
Rectangular prism: $l \times b \times h$,
(l = length, b = breadth, h = height).
Cone: $\frac{1}{3}\pi r^2 h$,
r = radius of base, h = vertical height.
Pyramid: $\frac{1}{3}$ area of base × h,
(h = vertical height).

AREA AND MENSURATION

Rectangle area = base × height.
Parallelogram area = base × perpendicular height.
Triangle area = $\frac{1}{2}$ base × height.
Circle area = πr^2 (r = radius).
Circumference of Circle = $2\pi r$.
Area of sphere = $4\pi r^2$.
Area of curved surface of cylinder = $2\pi rh$,
(r = radius, h = height).
π = 3·14159.

SI (Système International) UNITS

Mass: the kilogramme (kg)
Length: the metre (m)
Time: the second (s)
Force: the newton (N)
Electric current: the ampère (A)
Luminous intensity: the candela (cd)
Absolute Temperature: the degree kelvin (°K)

The kilogramme is the weight of 1 litre of pure water at 4°C under normal atmospheric pressure (760 mm Mercury).
The litre is equivalent to 1000·028 cubic centimetres.

Degrees Kelvin (°K) = Degrees Celcius (°C) plus 273·15
Degrees Celcius are the same as Degrees Centigrade
Freezing point of water = 0°C = 273·15°K
Absolute Zero = 0°K = minus 273·15°C

Mellor - Lyer
Fare una cura a fornat
Lavoro in questa
Nel fare

Silvine

Reg. Trade Mark

EXERCISE BOOK

Appunti
Castelvecchio
(relazione fatta a fine aprile
1983)

Name.....

Subject.....

REF 130

~~Tem~~ La percezione del "mondo esterno"

Il mondo delle cose
con cui siamo direttamente a contatto.

I diversi modi di vedere la realtà: come la vedono i filosofi gli artisti, i diversi scienziati (biologi, geografi, fisici)

Il mondo come lo vediamo e come lo studiano gli psicologi o più precisamente i percettologi.

~~Vari modi di vedere i problemi percettivi.~~

Il presupposto realistico

Realtà costruita e realtà percepita (Rausch)

La percezione come conclusione di una catena di processi a partire dalla stimolazione degli organi di senso.

L'oggetto fisico (o "bersaglio") e l'oggetto percettivo.

Ha senso questa distinzione? Non sono la stessa cosa?

Il realismo ingenuo

critica a) trovare alla fine della serie di processi quello che era al principio

La distinzione fra mondo percettivo e mondo empirico

Le illusioni più comuni – le illusioni sensoriali

Il tentativo di postulare che gli strumenti percettivi sono mezzi di informazione. La cellula è uno strumento di informazione o semplicemente il risultato di una serie di processi fisico-chimici? E se è così, perché un aggregato di cellule dovrebbe essere uno strumento di informazione?

Il punto di vista informazionistico porta inoltre nuovamente ad una frantumazione. Il sistema nervoso è, come i diversi strumenti di informazione inventati dall'uomo, costruito per un dato scopo.

Il punto di vista gestaltistico non perde da questo pre supposto. Si tratta di un insieme di processi funzionali ciò che hanno ~~delle~~ delle caratteristiche in gran parte ignote, e che portano fra altro alla percezione e alle sue caratteristiche.

Ma perché in generale il mondo percettivo e il mondo empirico si comportano così bene dal pittoresco entro certi limiti il medesimo inganno?

Secondo me per ragioni di selezione naturale, ma la selezione naturale può spiegare il fatto della sopravvivenza di organismi con determinate caratteristiche, ma non il modo in cui funzionano. Questo resta da scoprire.

L'informazionismo parte invece dal presupposto che gli organismi sono strumenti di informazione, e si trova a dover spiegare in modo particolare gli errori di informazione. L'informazione presuppone che gli strumenti siano un mezzo veritiero della realtà.

Il rifiuto del realismo ingenuo porta ad una conseguenza importante: la pluralità dei mondi percettivi. Il realismo ingenuo può trovare una linea di difesa sostenendo che percepiscono tutti lo stesso mondo e quindi la relatività fra i diversi mondi percettivi individuali risulta priva di senso.

A questo punto è utile prendere in considerazione la percezione degli animali. L'esempio più drammatico è quello della zecca che ha solo la possibilità di cogliere l'emanazione della pelle di un mammifero, ma anche gli esempi di animali molto più vicini al l'uomo, ~~offerti~~ descritti nel classico volume di v. Uexkuell possono servire a questo scopo. Non è vero che vediamo tutti le stesse cose, ma anche se partiti esattamente ~~alle~~ nelle stesse condizioni, vediamo cose più o meno diverse.

Si potrebbe rispondere che gli strumenti di osservazione di cui ognuno, uomo o animale, dispone sono diversi, e quindi, anche fatti nascere in ciascuno stessa, possono cogliere aspetti diversi della realtà.

Ma a questo punto vanno considerati quei casi in cui si percepisce qualche cosa di diverso pur a parità di condizioni percettive.

Untitled

seems

The function of the perceptual illusions in research

Having to speak about perceptual illusions, it seems well to begin with a definition. We speak of an illusion when the attributes of a perceived configuration differ from the corresponding characteristics of the target.

Let us give an example: the paper with the drawing is the target, and the a and b-segments are equal as I draw them equal; but in the perceptual configuration they are unequal.

There are two ways of considering perceptual illusions. The more common one is to consider them exceptions, where our perceptual apparatus did not function well, and therefore it did not give us, as it always does, trustworthy information about the real world.

The other way is considering them as alarm signals, breaks in the cuirass of our naive realism, through which the difference between perceptual and real world becomes directly visible.

There is a natural tendency towards naive realism, that is to ignore the above difference and to think that what we see is the real world.

There are several ways to preserve our realism. So f. ex. when in a car accident the driver says that he did

So

drawer

not see the person crossing the way. What is meant in this statement is that he did not direct his look or his attention to the person: in other words, his perceptual apparatus did function well, only it had not been used the right way.

Perceptual illusions are important, because with perceptual illusions this type of explanation does not function.

Let us take the famous example of the Gauffelo. There is a very big homogeneous wall in front of me and I see fog. No change of attention and of gaze direction helps. We have to explain why we do not see the wall, although it is in front of us.

We begin with looking for the solution of a special phenomenon. But soon or late our scope widens. The problem becomes more general. Why do we see a wall when there is a wall? Why do we see the color centered on a surface and empty transparent space before it? In other words not only the illusory perception but also the trustworthy one puts a problem.

This is the thesis I intend to illustrate with some examples: the function of perceptual illusions is to show us that the perceptual world is a set of

problems to be discovered ~~before and~~ first, and then to be studied and solved. My examples should show how, starting from illusions, from a limited special problem a wider insight develops.

V

a) Transparency

My first example is transparency. First of all I have to meet the natural objection that the conditions for perceiving transparency are physical, that transparency is a physical and not a perceptual phenomenon. Than let us do a little experiment. (I) Do you see something transparent here? Well, there is nothing transparent here, only a mosaic of opaque pieces of cardboard. And here (II) Certainly not. But in fact the red plastic is transparent (III) So, I reached two results. First of all I showed that physical transparency is neither a necessary nor a sufficient condition for perceiving transparency. Obviously, because the visual system does not receive any information whether the light rays stimulating the retina are passing through a transparent layer or not. Second, therefore we can study the perception of transparency either with apparent or really transparent targets or in conditions of ~~real~~ physical transparency, at will.

Then, what gives rise to the impression of transparency? Let us do a little demonstration (IV) Now you see transparency where there was not. This experiment shows that transparency depends on a complex stimulation, as local stimulation remained the same did not change.

The result is that studying a perceptual illusion you obtain results which are valid also for a non illusory perception. You are free to use both illusory or non-illusory targets to study the perceptual phenomenon of transparency. The phenomenon being studied does not regard just an illusion, but a trustworthy perception as well.

~~Then~~, Having reached the proof that there is no link between physical and perceptual transparency, it is possible to study the perception of transparency either under conditions of physical transparency, or under conditions of apparent transparency. In other words, the phenomenon being studied does not regard just an illusion, but a trustworthy perception as well. According to the opportunity (That is, according to the conditions having to be ~~changed~~ studied) the illusory perception or the trustworthy perception can be used as a ~~target~~ display for research.

b) Apparent rest

There is a typical example of a special problem widening into a general one: the phenomenon called apparent rest.

(V)(VI) No time to do the experiment properly. People has in general a coercive impression of a resting circle successively visible in all of its parts

(a) Met this type of phenomenon as others did, working with a Maxwell disk; the first step of my study was looking for the necessary conditions. Through systematic variation I found that there was only one necessary condition: one part of the border has to correspond to the trajectory of a point. (The illusion can be obtained with rectilinear motion also).

(b) After years, having the impression not having explained the phenomenon, I put a new question "Which movements on the proximal stimulation (retina) are caused by the motion of ~~the~~ one of the above targets?" Let us take a simple one via and

Let us consider a simplified drawing (VII) Through rotation the retinal region stimulated by the a stimulus is decreasing on one side and increasing on the other. The contrary happens to the ~~b~~ region stimulated by b.

But let us see what happens on the retina if the stimulation is generated by a non-illusory target.

(VIII) (~~XX~~)

In fact, the stimulation is the same in both cases and therefore the perceptual result is the same.

The problem has disappeared

(c) But there is still a problem. Why do we see, in both cases a rectangle moving on a resting circle and not the whole configuration rotating?

(The problem has widened: it regards the perception of a moving object, not just an illusion.)

Let us consider a very simple situation: what happens on the retina when the target is an homogeneous figure moving on a homogeneous but differently colored ground. There is no motion of the proximal stimulus: there are only increasing and decreasing of homogeneously stimulated regions. Only the border, the line along which there is an abrupt change of stimulation, is shifting.

Now let us consider the encounter with another differently colored figure (IX). There happens to be a complicated exchange of decreasing ~~of~~ and increasing of the retinal regions stimulated by the target. But the difference regarding the retinal projection of the borders is not. The projection of the border of the moving figure is shifting, while the projection of the border of the resting figure is increasing and decreasing but not shifting.

(d) Now let us go back to our illusory figure. What happens of the borders of the apparently resting part of the configuration? They are increasing and decreasing, but resting, as the borders of the resting figure do. Then, in the special case of our figure, as in the general case of moving and resting objects, we ~~are~~ have two types of borders, which we shall call Kinetically active and Kinetically not active: the first ones only giving rise to the perception of a moving figure.

Our configuration gives rise to a retinal projection with both type of borders: in other words its borders are Kinetically non homogeneous. And what happens: The configuration splits into two figures, each with Kinetically homogeneous borders. The tendency through Kinetically homogeneous borders is all but exceptionally acting. Every time when a moving figure is passing in front of a resting one, a similar situation is arising at the retinal projection level: we are faced with a configuration with Kinetically inhomogeneous borders. And instead of a calleidoscopic widening and shrinking figures, through the tendency towards Kinetically homogeneity of bor-

ders, a figure moving in front of a resting figure is perceived.

c) The disappearing hole

Demonstration: What do you see. Touch the rectangles beginning with the right one. (Demonstration without apparatus.)

We began, as always, with varying ~~tips~~ conditions systematically. The only necessary condition revealed to be the homogeneity of the surface behind the hole.

Then, as usual, we considered the proximal stimulation, and it appeared that there was a difference between a piece of paper pasted on a cardboard and a hole only if the insides of the hole was inhomogeneous. In this case the difference was caused by retinal disparity (i.e. the location of the background of the hole on a different plane) and difference in focussing. Otherwise there was no difference and also in this case the problem seemed to disappear.

But there is still a question to be asked. Why do we see a paper pasted on a cardboard and not a hole? There is a well known quality of the border, the one sided function of the border, that normally outlines only insides and not outsides. But why the border is acting this way, is still an open question.

And then, a strange exception: if the inside of the hole is black, notwithstanding its homogeneity, it is perceived as a hole.

Research on this field has been carried on by Professor Da Pos, who discovered a strange fog phenomenon and by Dr Cordon who has been able to obtain the opposite phenomenon, the perception of a non existing hole.

As ~~the Time is~~ I have
For lack of time I skip the first part of my paper and confine myself in saying that the purpose of my demonstration is that studying thoroughly a perceptual illusion the problem widens and becomes general, where illusory as well as

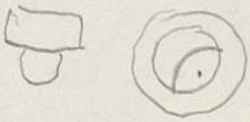
1. Why I am studying perceptual illusions
Because they help to ~~see~~ discover problems that under normal conditions (would not be noticed) are hidden

F.ex look at a wall. Problem?

Ganzfeld experiment or g. illusion (Metzger)
Very big wall, homogeneous in color
Person sitting on a very high chaise, ~~his head~~ 110 feet away, looking at the wall
(he cannot see other objects)
Fog. Why?

The most simple perception is three dimensional

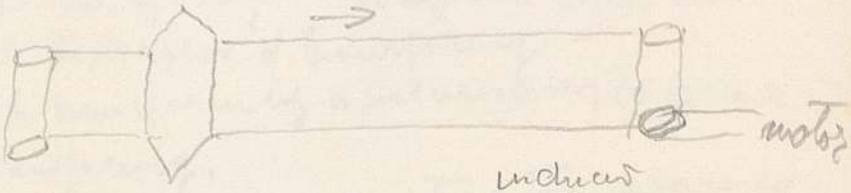
But not only this problem. Another problem has to be solved: Why do we see a wall when there is a wall? Which are the conditions necessary to see it?

2.  what do you see

<u>apparent rest</u> – successive completion
Wittmann (B)
Werner & Wolfgan

a) variations of conditions
at least one part of the contour has to correspond to the trajectory of a point.

HARPER & ROW CARES ABOUT CALCULUS



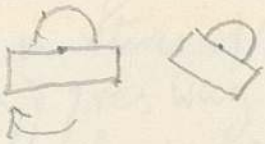
induced motion

poles – wires

b) what happens at the stimulus level

(apart from the lens problem on the retina)

exactly what happens if you move the rectangle upon a circle.



No problem? Why do we see in both cases one part moving and one part stay

c) Kinetically active and K. non active borders

shifting and non shifting borders

also <u>sorting</u> objects have kinetically non-active borders

Simple empiricists

naive realism

HARPER & ROW CARES ABOUT CALCULUS

3. Perception of transparency

a) ph. transparency is not sufficient to give rise to the perception of transparency

b) ph. transparency is not necessary to perceive transparency.

Ph. tr. cannot explain perceptual transparency

Every cell of the retina is stimulated by a mixture of rays of different wavelengths and gives way to an impression corresponding to the laws of color mixture.

The problem is "When does a mixture of rays ~~give~~ stimulating the retina produce two colors, one behind the other?

Figural and color conditions

Transparency as color fission

fission colors are such that ~~put~~ mixed together they give again the stimulus-color.

Talbot's law = color mixture
= color fission

Beck
film color

4. Perception of a hole

One-sided function of borders

(Koffka)

A closed contour requires an inside surface, which in this case is obtained at the expense of the surface behind that splits phenomenally, being perceived as a surface inside the contour and as a "amodal" continuation of the surface behind.

focus – disparate images on the 2 eyes

The contrary of the gestalt

Thus ~~a not~~ a real surface was not seen
a not existing surface was seen

The function of perceptual illusions in research

(a

1. Definition attributes of a perceptual configuration and corresponding characteristics of the target

2. Two ways to consider Perceptual Illusions

a) Exceptions perceptual apparatus does not function well, not giving as always trustworthy information about real world (interesting special problems)

b) Alarm signals (important problem neglected) ×

Breaks in the curtain of our naive realism through which the difference between perceptual and real becomes visible.

× Forces to see as a problem where no problem seemed to be.

3. Distinction between perceptual and real is fundamental, ~~and is easy to recognise~~ but also the specialist goes out to naive realism (denial of such distinction) in common life. Apparently necessary in order to live a normal life, to ignore or to disregard this difference.

4. Ways to preserve naive realism.

stumbling in a step "I did not notice it"

car accident (sometimes) "I did not see the person"

(4.) [In fact, according to the distinction (perceptual and real environment) the ship, or the person did not exist in our perceptual environment]

Explanations mean that we should have been able to see the object, changing direction of look or attention: perceptual apperatus functioning exactly, we do not use it the right way

5. Impossibility of preserving the naive realism in case of perceptual illusions. Explanation does not function.

Example of Ganzfeld phenomenon

Not wall but fog. Why? Special explanation

6. Widening of the problem. Sudden discovery that ~~also~~ it was only a part of the problem. Not only conditions ~~acting~~ when we do not see the wall, but also necessary conditions had to be found out - to see a wall when there is a wall. [why color condensed on a surface at a distance and before it colorless transparent space?]. And why only a wall, and not a book, a person etc.

In this sense Perc. ill. are precious signals forcing us or aiding us to acknowledge a problem where there seemed to be no problem, and everything appeared obvious.

The perceptual world, the only etc.

The function of perceptual illusions in research

The radical environment

As the subject of this paper are perceptual illusions, it is perhaps useful to begin with a definition. According to ~~a famous specialist of this subject~~, Professor Rausch ~~of the University of Frankfurt in Germany~~, it is a case to speak of a perceptual illusion when the attributes of a perceived configuration differ from the corresponding characteristics of the target.

I give an example from the well known geometric optical illusions (Müller Lyer, Fig. 1) in order to clarify the meaning of the concepts of target and perceptual configuration.(1) But the demonstrations in this paper will not concern the geometric-optical illusions.

At this point it is quite natural to ask the following question. Why have the ~~optic~~ perceptual illusions an important place in almost every handbook of Psychology? Are not the illusions unimportant little problems which only a pedant can choose as an object of research?

~~Such~~ a radical point of view was represented by ~~the famous American Psychologist~~ James Gibson, a dear friend of mine who died ~~x~~ years ago. We discussed several times this topic, the last time some month be-

(1) In the Target the parallel segments of the Müller-Lyer figure are equal, while in the perceptual configuration they are unequal.

aim

~~To make the importance of the P. Ill.~~
~~Two opposite points of view about P. Ill.~~

fore his end.

At my opinion there is a special reason to stress the importance of perceptual illusions. I'll begin with stating briefly my theoretical standpoint; however the main part of this ~~seminar~~ paper will consist in demonstrating and discussing some phenomena which will serve to illustrate the Theory.

At the beginning, but not only at the beginning but often also nowadays, the illusions were considered as exceptions, whereour sensory apparatus did not function well, and therefore did not give, as ~~they~~ it always do, true and trustworthy information about the real world. They were studied and are still studied as interesting special problems.

A point of view that never has been completely put aside is that the sensory apparatus cannot lie, and therefore higher functions have been looked for, interfering with sensory data and being the origin of perceptual illusions.

It is however possible to consider perceptual illusions in a quite different way. According to this point of view they are considered alarm signals, breaks in the cuirass of our naive realism, through

which the difference between perceptual and real world becomes directly visible.

The very function of perceptual illusions is to force us to see a problem where before there seemed to be no problem at all.

It has been always very interesting for me to ascertain that not only the layman, the ordinary man, but also the specialist, who founded all his research on the difference between perceptual and real falls back, in his common life and behavior, to naive realism in an absolutely natural way: what he sees is a car, and not a moment he is thinking that it is the perception of a car.

It is (almost perhaps) apparently necessary, in order to live a normal life, to ignore or at least to disregard the difference between perceptual world and reality (behavioral and geographical environment, according to Koffka's originary concepts).

(2) K. Koffka, Principles of Gestalt Psychology, Cap. II

We have a typical way to defend ourselves and to preserve our realism. If we stumble in a step we simply say that we did not see or did not notice it. And in the same way we often explain the tragic happening of a car accident: we did not see the person. It is clear that, according to the previous distinction between behavioral (or perceptual) and geographical (or real) environment, the step, or the person did not exist in our perceptual world. But with our explanation we are meaning that we ~~would~~ should have been able to see the object under discussion, if we had only changed the direction of our look, or if we had changed the concentration of our attention. What we mean is that the ~~to~~ perceptual apparatus was functioning exactly, but we did not use it in the right way.

But there are cases, and these are just the perceptual illusions, where this explanation does not hold. In these cases, direction of look and attention do not help to perceive what really is there.

Let us take as an example the famous Lanzfeld experiment of Wertheimer and Metzger. There is a wall in front of us, and we see

just fog. In this case there is no way to escape the problem, to make it disappear. The phenomenon change in attention or in directing of the look does not change what we are seeing. This type of phenomena generates a crisis of our naive realism.

We have to explain why we do not see the wall, although it is in front of us.

Our first attitude in these cases is to look for a solution of the illusion as a special limited phenomenon. ~~Why~~ What we ask is: why is ~~our perceptual apparatus in this special case~~ not regularly function in this special case ~~our perceptual apparatus, which~~ although it as a rule gives us a true reproduction of reality?

This is the natural way to follow, at first, for every perceptual illusion. It is like we behave if in an old building, a piece of plaster falls from a wall and we get it repaired so that the color is almost homogeneous and for the superficial observer there is no fault to see. The same can happen a second, a third time. But sooner or later the whole plaster falls, and to the big amazement and happiness we discover that ~~under the~~ a fresco was hidden under the plaster.

Ganzfeld

Something similar happens, sooner or later, when a perceptual illusion is studied [Not in right]

Let us go back to the Ganzfeld-Phenomenon. The first, and more natural question is "Why don't we see the wall?" But suddenly – after a more or less long delay – we discover that this is only a partial problem. Then we ask ourselves not only under which conditions we see fog instead of a wall, but also under which conditions we do see a wall, when a wall is really in front of us. Why do we see, in this case, the color condensed on a surface in front of us, and, before it, colorless transparent space? And why does the problem concern only the wall? Under which conditions do we see a chair, a desk, a book when these objects are lying in front of us?

In this sense the Perceptual illusions are precious signals forcing us or aiding us to acknowledge a problem where there seemed to be no problem and everything appeared to be obvious. In this sense the Perceptual illusions took an important part to the birth of the modern perception psychology and convinced us perception psychologists (I think at least the

the majority of us) that the perceptual world – the only world with which we have direct contact – is all a lot of problems, which have to be discovered – and this is often the most serious difficulty – before trying to solve them.

With this assertion I am ending the first part of my ~~talk~~ paper. Now I'll try to show – using as examples some perceptual illusions which have been observed and studied by my collaborators and me – the development of the problems according to what I said before, that is to show how from a limited special problem, a wider insight develops.

Everybody observes Transparency

1. Transparency a physical, not a perceptual phenomenon

Counter example a)  b) 

Physical transparency neither a sufficient nor a necessary condition for perceiving transparency

Naive realism was wrong

2.  Transparency

Perception of Transparency depends on a complex stimulation of the Retina. Field- or Gestalt phenomenon

3. A perceptual illusion as a way to study a phenomenon

Study done by my collaborators and myself, varying systematically form and color of the target in order to discover the necessary conditions of the phenomenon and ~~some~~ of the mathematical laws ruling it

Naumann is also

4. But ~~it has to be~~ an Example of the widening of a special problem offered by a perceptual illusion

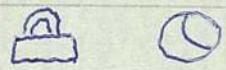
a) Why is just this figure illusing us? Why not another one? ~~When~~

b) Research of the necessary conditions

c) Discovery that the necessary conditions are present also in the ~~normal~~ common case, when physical and perceptual transparency coincide.

d) Then the problem has widened. We do not study apparent transparency but just transparency, be it apparent or real.

Apparent rest

Demonstrations 1), 2) 

Perceptual illusion named apparent rest

Possibility of describing the successive steps bringing to the enlargement for the problem because ~~they~~ it needed several years to develop. Let us take the simpler case

(1.) Systematical change of the conditions 3) 

[Phenomenon discovered independently by two Psychologists in the early twenties, in the Maxwell disk. Wertheimer, Werner] 4)

a) change of form. Maxwell disk not necessary nor the best form to get the effect

b) number of differently colored surfaces

c) color, texture etc

Only one condition necessary: at least a part of the contour corresponding to the trajectory of a point.

(also with rectilinear trajectory: rails, train)

~~cylinder turning~~ belt ~~moved~~ moved by a cylinder

$\boxed{\text{15 years after}}$ railway – poles moving, wires resting

(2.) New point of view: What happens on the retina

Which modification in the proximal stimulation (retina) are caused by the motion of the target?

Demonstration 5 (disappearing of another same modifications (increasing on one side of the stimulated region on one side, decreasing on the other side) in the case of real and apparent rest

Apparent rest

A much more striking example where from a ~~[illegible]~~ special problem a wider insight ~~develops~~ is the perceptual effect called apparent rest. If the display reproduced in Fig. 5 is rotated slowly around the center of the semicircle[3][4], what we see is a complete resting disk with a series of circles inside, which is periodically covered and uncovered by a rectangle turning on it. If the display of Fig 6 is rotated slowly around the center of the inside arc, we see a resting circle periodically covered and uncovered by a peripherically located circle rotating on it.

The phenomenon was observed by Wittmann (1920) and by Werner and Wildhagen (1924) on fusing two colors with the Maxwell disk (Fig. 7). When the current is interrupted, the rotating disk ~~is slower~~ slows down still resting. When the speed is little, one sees one sector (the minor one) rotating upon a steady disk.

Strange enough, ~~both authors~~ the above authors ~~stucked~~

[4] (3) If the display is reproduced in normal size (radius ~~abou~~ about 15 cm) the effect can be observed at home, using a turntable for records

Fig. 5

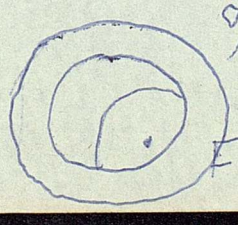


Fig. 6

Fig. 7

B The problem seems to have disappeared

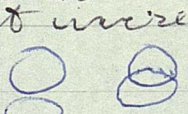
(3.) Still a problem. Why do we see in both cases a rectangle turning on a resting circle, and not a ~~turning configuration having the form~~  ?
a half circle rotating together with a rectangle ? illusion
At this point the problem does not regard the ~~illusory~~ but ~~also the~~ equally the non-illusory situation

(4.) A more general problem: what happens on the retina when an object is moving in front of a ground
a) (motion of an homogeneously colored figure moving in front of a differently ~~colored~~ homogeneously colored ground)

stimulation
Increasing on one side and decreasing on the other
increasing - decreasing hom. stimulation figures

But what of the borders (lines corresponding to abrupt change of stimulation): they are wandering

b) Encounter with a resting figure: moving figure moving in front or behind the ~~of~~ resting one: same effect about the region stimulated on the retina (increasing or decreasing) But the borders behave elsewhere in the two cases: borders of resting objects are resting. They just increase or decrease but do not wander.



c) distinction between 2 types of borders, wandering or resting

(5.) Back to our illusion: also 2 types of borders
Border corresponding to the trajectory of a point does not wander: kinetically matter border.

Il caso dell'oggetto con margini eccitamento eterogenei, che si spezza in due oggetti con margini ognun eccitamento omogenei è il caso che si verifica normalmente: margini in quiete (eccitamento passivi) e margini in movimento (eccitamenti attivi) danno luogo non ad una figura in espansione ma ad un oggetto in movimento e un oggetto in quiete.

So the distinction between borders of moving objects and borders of resting ones ~~seems~~ became important to explain our illusions. But in fact just the contrary happened: The distinction between the two types of borders – kinetically active and inactive – has been suggested by the illusion – the phenomenon of apparent rest – and then it appeared that the distinction was important also under usual conditions (when the perceptual world gives useful informations about the reality.)

(6.) So it is clear that moving object with kinetically inactive borders cannot be distinguished from a resting object.

But what about the case where an object has one part of ~~this~~ his borders kinetically active and one part kinetically inactive? under favourable conditions – that we have not time to specify here – an object with kinetically heterogeneous borders splits into two objects, every one with kinetically homogeneous borders, that is one moving and one resting object.

(7.) But let us consider again the general problem. What happens on the retina if an object is moving in a field of irregular and irregularly placed things?

It is generally accepted that physical motion is not acting as a stimulus

Apparent rest (4)

According to our description there are regions increasing and decreasing, as well corresponding to resting things as well as to the moving ones. There are jumps of stimulation, that is borders resting and increasing or decreasing, and or on the other hand moving. But because of the tendency towards the kinetic homogeneity of borders – first observed in the case of apparent rest – instead of a calendoscopic change of increasing and decreasing objects or surfaces ~~we perceive~~ kinetic active borders unify together and we see just one object moving among a series of resting objects.

So, starting from the analysis of a perceptual illusion we got to a contribution to the optical theory of motion.

The perception of a hole

What do you see? Please ~~come~~ go nearer. Please cover with your index the square at the left.

1. Contrary of the Gestalt phenomenon

2. Variation of conditions. making more or less evident
Possible to vary the frequency by varying some conditions (width of the frame, size of the opening etc) but the only real necessary condition is the homogeneity of the color of the region behind the hole
Structuration of the surface at the back abolishes the phenomenon.

3. Explanation

Koffka's one-sided action of the borders. If there are not conditions acting against, the borders are part of the inside and not of the outside region and give rise to a figure on a ground. However the figure-ground phenomenon is all but explained. The above illusion can ~~can~~ bring some new ideas.

4. Considered from the point of view of proximal stimulation the problem again vanishes: the stimulation is equal ~~if there is~~ whether there is a hole with an homogeneous surface on the back, or if there is a white homogeneous piece of paper attached on a differently colored surface. But when the surface on the back of the hole is figured, the stimulation is different

in the two above cases; in the case of the hole the images on the two eyes differs, ~~which it is the same in the case of an attached figure paper~~.

I have to admit that we are not yet ready to make the third step, showing the contribution of the illusion ~~for~~ to a more general problem of space perception. We only hope that it will not take us 75 years, as in the case of the apparent rest.

But although I cannot give a demonstration of it, it is perhaps interesting to say that one of my research group, a young girl, D'Cavedon has been able to obtain the opposite effect, discovering some conditions giving rise to the perception of a hole, where no hole exists.

For: if the brightness of two bordering surfaces are very similar

if the color of the surface behind a hole is deep black, we always perceive a hole.

Grafici t

t = 9,36 M (bianco) leggera pendenza verso il grigio
con l'aumentare di α
fondo nero, riferendosi a △□

t = 4,86 (vetro fine) ~~forte~~ pendenza verso il bianco
vetro dietro a t
fondo chiaro, pendenza più forte, vetro più basso
bianco più in alto

t = 0,53 (nero) forte pendenza verso il bianco
vetro molto più alto di t
fondo chiaro vetro a fine più alto, pendenza
maggiore

□ alfa?

△ e □ uguali o paralleli

Apparent Transparency

~~A case of a perceptual illusion is apparent transparency~~

My first example is transparency. Of course the study of the perception of transparency we have to answer a natural objection.* Transparency is not a perceptual but a physical problem: we perceive transparency when a physical object is permeable to the light. Therefore we have to begin showing that physical transparency is neither a ~~necessary~~ nor a sufficient condition for perceiving transparency. (1) The display represented in Fig. 2 ~~This display~~ is generally perceived as transparent. But there is nothing physically transparent there. It is just a mosaic of opaque pieces of cardboard of different color. So, physical transparency is not a necessary condition for perceiving transparency, or in other words, there are cases of apparent transparency. ~~But~~ On the contrary, nobody perceives transparency in ~~this other~~ display (2) of Fig. 3 while the red plastic which is glued upon the white cardboard is physically transparent. (3) ~~The color can be changed without changing the result~~ (4) And this proofs that physical transparency is not a sufficient condition to perceive transparency.

But thinking of the stimulation originating the perception of transparency it is clear that the visual system does not receive any information about the conditions giving rise to it, namely if the light rays stimulating the retina ~~went through~~

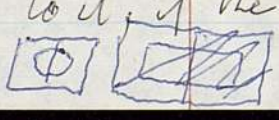


Fig. 2

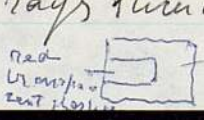


Fig. 3

(2) The color can be varied without any effect on the phenomenon

passed or not through a transparent medium. or not

How do we study perceptual transparency? As every other perceptual phenomenon, changing ~~systematically~~ the conditions systematically, ~~in par~~ especially the colors and the forms of the surfaces giving rise to it. Following this way my collaborators and I have been able to formulate mathematically the necessary conditions of the perception of transparency.

But here ~~we~~ I have to confine myself to a little demonstration, which is in a way typical as it shows an important aspect of the phenomenon. Putting ~~the~~ two displays 2 and 2a together in such a way that there is continuity between the borders of the ~~red~~ plastics, transparency is perceived. We are forced to draw the conclusion that transparency depends on a complex stimulation of the visual organ. It is what we call a Gestalt phenomenon; or in other words it does not depend on local stimulation, which did not change.

But the ~~more important~~ conclusion of our ~~studies~~ demonstrations is that the necessary conditions of perceptual transparency, although studied starting from cases of apparent transparency, are valid also in the more common case, when physical and perceptual transparency coincide. The problem has widened: it is not more the problem of the conditions of apparent transparency, but the general problem of the perception of transparency, without restriction.


Fig. 3a


Fig. 4

did not change systematically the form of the display but stuck to the Maxwell disk. 11

With 5 (4) tried to give an explanation of the phenomenon, asserting that when the subject concentrates on the motion of the minor ellipse, the major one closes in a circle. An explanation which is evidently wrong, because as more the subject concentrates its attention on the apparently resting circle, as greater the evidence of the phenomenon. (5) 6

Changing systematically the shape of the display I discovered immediately that the Maxwell disk was the worst display for demonstrating the phenomenon, and that the only necessary condition was that at least one part of the contour corresponds to the trajectory of a point.

It is therefore perhaps opportune to stress that the phenomenon is not limited to the rotatory motion but can be obtained with translatory motion as well.

6

(5) This shift of attention succeeds easier with displays of Fig 5 or 6.

5

(4) I was not able to retrace, either asking Professor Werner himself at Hamburg University, W. and W.'s paper

The second example of ~~a perceptual illusion~~ a special problem widening into a general one is an illusion I called apparent rest. 1) 2)

As you see, in both examples you have the coercitive impression that a resting circle is successively visible in all its parts, being successively covered and uncovered by another figure (a rectangle in one case and a circle in the second) turning upon it.

I thought to have discovered it, but it had been discovered before, by Wittmann in 1920 and rediscovered by Werner and Wagner.

In fact it is very easy to observe it when a Maxwell disk is beginning to rotate, or is ~~slowing down~~ rotating slower and slower when the current has been taken off to stop it. The disk being made of two differently colored sectors, when it turns slowly, ~~at a rate~~ not at a fusion speed, one of the sectors, generally the smaller one, is perceived as turning upon a steady disk.

The explanation of the discoverer was based on attention: while you attend to one of the sectors, the other shuts in a circle. Not a very satisfactory explanation, and however a wrong one. As everybody will easily remember, it is on the steady disk and not on the moving figure that attention is ~~more~~ naturally concentrated; and however, concentrating the attention

A typical example of apparent rest with translatory motion is obtained with apparatus of Fig. 8 while the reverse of the phenomenon

Fig. 8

is what we observe traveling with a train when we see the telegraph poles moving while the rails are resting

2. ~~A few years after it happened to me to see the problem~~ But the problem can be seen from another angle, that is from the point of view of the retinal stimulation

on the steady disk, the phenomenon does not generally change. And, strange enough, both researchers stuck to the Maxwell disk, which does not offer the best conditions to study the phenomenon.

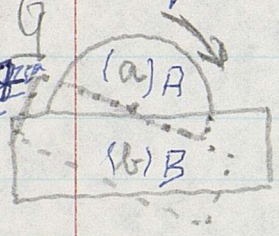
I changed systematically all conditions: first of all the form of the turning object, the form of its parts, the number of differently colored parts, the colors, the texture, and found that there was only one necessary condition of the phenomenon: at least the contour of a part of the rotating surface has to correspond to the trajectory of a point. This part is perceived as steady, and the other parts are seen as moving upon it. (If that part is textured, the texture is perceived as moving upon a steady surface). The above statement explains why the Maxwell disk gives the impression of unsteadyness: there is a conflict between the two sectors, each ~~afoo~~ having the contour corresponding to the trajectory of a point and tending to be perceived at rest: a conflicting situation. It also shows that the phenomenon is not confined to a rotating object: the same effect can be observed with translation, and is often observed through the window of a moving train, where things apparently move, and poles appear to move upon crossing wires.

(2) But has been the phenomenon explained through proving its necessary condition?

I was never satisfied, not having the impression that I had reached what I was looking for. But only after several years it became clear to me that I had theorized the conditions on the target. But this was only a first step: what I had to study were the effects of the modifications of the target on the proximal stimulation, namely that is the retinal projection.

Then the new question is "Which modifications on the proximal stimulation are caused by the motion of the target?" Let us try to give a very raw description of it.(6)

It is easy to see that when the target, made of two differently colored regions, rotates, (we can, we have the simplified target) the region stimulated by stimulus a decreases from one side and increases from the other, and the contrary happens to the region stimulated by the b stimulus. The result is, that we are perceiving the B region turning upon a steady complete circle.



Figure

But what happens if we imitate with the target what we were perceiving, that is if we use as a target a steady circle upon which a rectangle is turning? Then we see, to our surprise that what happens on the retinal projection is exactly the same: the A region is increasing on one side and decreasing on the other, and the contrary happens to the B re

(6) We can/ive ourselves to take into consideration Fig. 5, for the sake of simplicity

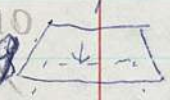
gion. Therefore, as the stimulation is the same in both cases, the perception ~~has to be~~ is necessarily the same. The explanation is very simple and there is no more problem. Our problem ~~has simply~~ seems to have disappeared.

3. However, a more thorough analysis shows that not everything has been explained. Because, while it is clear that, the stimulation being the same, the perception has to be the same, it is by no means clear why we perceive in both cases a figure rotating or a resting one, and not the whole configuration rotating. In other words, why do we see in both cases a rectangle ~~rotating~~ ~~turn~~ turning on a resting complete circle and not a half circle rotating together with a rectangle?

It is interesting to point out that the problem has widened: it no more regards the illusion only, but the non-illusory situation also.

4. Than we are faced with a more general problem: what happens on the retina when an object is moving upon a ground?

a) To study a typical example, let us simplify the case considering an homogeneously colored figure moving in front of a differently homogeneously colored ground. (Fig. 8)

Fig. 8 

The result – on the proximal stimulation – is that (corresponding to the figure) an homogeneously stimulated region ~~is increasing~~ is increasing on one side and decreasing on the other; while the contrary is happening to ~~another~~ the homogeneously stimu-

(~~corresponding to~~) 15 Then ~~we assert that~~ ~~12/5~~
lated region (the ground). ~~As a conclusion~~, there are two homogeneously stimulated regions that are increasing on one side and decreasing on the other - but they are both non moving. So there seems to be no motion at all on the retina. But there is something - the border between the two regions, that is the abrupt jump of stimulation between one region and the other, ~~-~~ which is wandering.

b) Now let us consider the ~~encounter~~ of the moving ~~figure~~ figure with another (still differently colored but homogeneous) figure, which is resting. We are interested in two different possibilities: either (1) the moving figure is passing ~~in front of~~ behind the resting figure or (2) ~~behind~~ in front of it. ~~There is a similarity between (1) and (2) (2) The moving figure is,~~

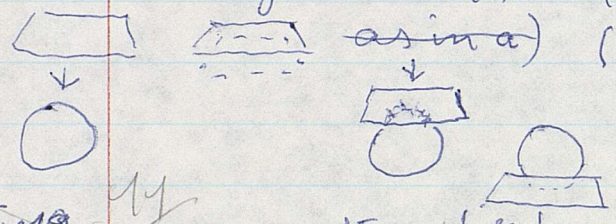


Fig 19

~~as in a)~~ (1) At the moment of the encounter the stimulation corresponding to the moving object ~~goes on increasing~~ decreases on one ~~side~~ and after a while ~~decreases~~ on the other side, ~~but this time~~ on the expense of the ~~resting figure~~ ground. But (2) as it passes ~~behind~~ in front of the figure it ~~begins to shift~~ the resting figure which decreases on the same side, but this time at the profit of the stimulation corresponding to the moving figure, while after a time on the other side it is growing at the expense of the stimulation corresponding to the ground.

~~The opposite is happening if the moving object is passing behind the resting figure.~~ While in the front

case (1) ~~it was~~ the ~~resting~~ moving figure was shrinking (because it was decreasing on one side while remaining unchanged on the other side) till sometimes disappearing and then widening; in the second case (2) that is when the figure was moving ~~behind~~ in front of the resting figure, it is the ~~moving~~ resting figure that shrinks at the beginning, then sometimes disappears and then widens till regaining her prior size and form.

~~However there are increasing and decreasing homogeneously stimulated regions, not motion. But what about the borders?~~ The moving as well as the resting figure are both giving rise to ~~widening and~~ increasing and decreasing of homogeneously stimulated regions, not to motion. But what about the borders? We see that there are borders between homogeneously stimulated regions that are resting and borders that are shifting. The borders of the retinal projection of the steady figure are steady while the borders of the moving figure are shifting.

5. ~~Now~~ Let us go back to our illusion. What happens of the borders of the retinal projection of the apparently resting ~~figure~~ part of our configuration? They are increasing on one side and decreasing on the other (as the borders of the retinal projection of the steady figure do, when it is covered or uncovered by the moving figure), but they are resting as the borders of the steady figure do.

So we are faced with two types of borders, the ~~two~~ shifting borders of the retinal projection of the moving figure, which we shall call Kinetically active borders and the resting borders of the projection of the steady figure as well as those of the ~~apparently resting part~~ projection of the apparently resting figure of the illusory configuration, which we shall call Kinetically non-active borders.

But let us see what happens when a configuration (an object, like our target) has some of the borders which are Kinetically active, and some Kinetically inactive, that is, it has Kinetically inhomogeneous borders. What happens in this case is our illusory result: ~~a~~ the configuration splits in two objects, each of them with Kinetically homogeneous borders.

But this case is all but exceptional. Every time when ~~the~~ a moving figure is passing in front or at the back of a resting figure, a similar situation arises ~~at~~ at the retinal projection's level: ~~it is~~ ~~when one~~ an object moving in front or behind another object, giving rise to ~~a~~ a configuration ~~figure~~ with Kinetically inhomogeneous borders.

~~But~~ Through the tendency towards ~~homogeneously~~ Kinetically homogeneous borders a moving figure wandering in front or behind a resting one is seen.

So, ~~when~~ an object is moving in a field of resting objects, instead of a calidoscopic change of widening and shrinking figures, ~~the real~~, ~~towards~~ through the tendency to

Kinetically homogeneous borders, the real thing is perceived.

We only need a cardboard with a hole in its central region, through which we see a part of ~~an~~ an homogeneous region of different color.

but as a figure, pasted on the cardboard, having as borders

8

(7) Often this simple demonstration does not succeed because the surface behind the hole is not really homogeneous (if it is a wall, there are shadows on it. But Prof. Da Pos constructed a simple gadget, which makes for every subject conveniently the disappearance of the hole

The disappearance of a hole

The third example of ~~an illusion, whose study interest~~ a problem regarding an illusion, whose study appears to be interesting above the ~~mere~~ mere illusion, is the problem of the perception of a hole.

The illusion is simply demonstrated, without any apparatus. ~~also~~ We only need a cardboard with a hole in its central region. ~~Demonstration~~ through which we look towards an homogeneous surface (e.g. a wall). ~~It shows that~~ The hole, if the surface behind it is homogeneous, is not perceived as a hole, ~~but~~ but as a ~~surface~~ figure painted on the cardboard and having as borders the borders of the hole. Varying ~~all~~ every condition (form, size, color) (X) NOTA the ~~only~~ only necessary one to obtain the illusion appeared to be the homogeneity of the surface visible through the hole.

But we already learned the lesson that what really matters is not what happens on the target, but the numerous conditions at the retinal level. Here we see that ~~while~~ there is a difference between the stimulation produced by a piece of paper of different color attached on a screen and a hole in the screen only if the bottom of the hole ~~is~~ is inhomogeneous; but there is no difference if the hole is homogeneous, because in this case there is nothing that could give rise to retinal disparity, ~~that is~~ or to differential focussing, that is to depth perception. Again the problem seems to have disappeared.

But ~~at~~ there is a ~~problem~~ problem unsolved in this

(X) we saw that although there are conditions favouring or hindering the phenomenon — D'Cardon made a quantitative study of it — it resulted that (7) V. retro pagina precedente 8 ALTRA PAGINA

case also: why do we see, in both cases, a paper attached on the surface and not a hole? The question seems to be solved by the one-sided functioning of the border, the border being perceived as a part of the included ~~region~~ and not of the including region of the field – a discovery due to Rubin and Koffka. But again, why is the border functioning this way? And than, a strange exception. If the insides of the hole is black, notwithstanding its perfect homogeneity it is perceived as a hole.

So, there are still several unanswered questions. The research in this field has been carried on by Prof. Da Pos and by Dr Cavedon, Professor Da Pos having discovered a very interesting effect of apparent fog, and Dr Cavedon having been able to obtain the opposite effect, putting on light some special conditions giving rise to the perception of a hole, when no hole exists.

At present, research on this subject is at rest. But it is just apparent rest.

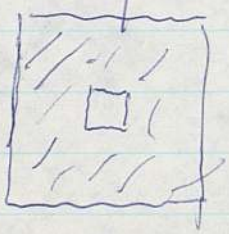


Fig. 11.12

Summary The function of perceptual illusions in research is discussed and demonstrated analyzing three perceptual illusions observed and studied by the Author: the apparent transparency, the apparent rest and the disappearing of a hole.

Fabio Metelli

Su alcune ~~Alcune osservazioni sulle~~ condizioni spazio-figurali della trasparenza. *

Stabilita la ripetizione del realizzarsi della percezione della trasparenza da condizioni cromatiche (Fig. 1a-c) e figurali (Fig. 1d) (Kanizsa 1956, Metelli 1962) i meccanismi di condizioni sono stati studiati separatamente. Le condizioni figurali sono state riprese in esame da Metelli (1975, 1981) e Kanizsa (1982) indipendentemente. Nella presente nota, che non ha nessuna pretesa di sistematicità, ci proponiamo di mettere in circolazione ed eventualmente tentare di chiarire alcuni punti che sembrano presentare un certo interesse.

Premessa

Numero delle regioni interessate al fenomeno della trasparenza

(1, 2, 3, 4)

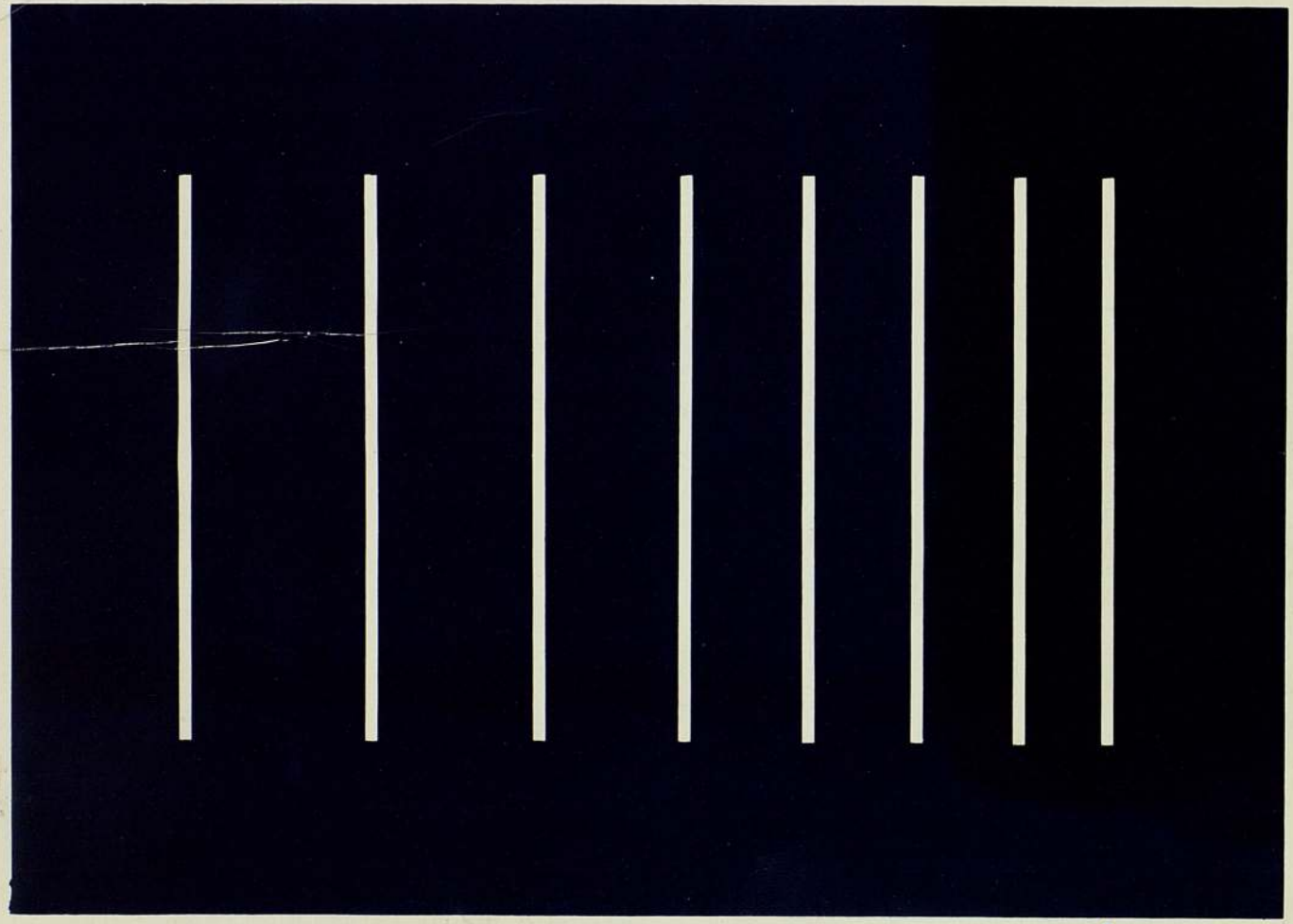
a) Trasparenza implicante un minimo di 2 regioni differenziate nel campo visivo

a1) Ombre trasparenti

quando un'ombra "portata" cade su uno sfondo omogeneo, si hanno due regioni di diversa chiarezza, l'ombra, e alla superficie che in

---

* Mi è gradito ricordare che il mio interesse per la Percezione della trasparenza ha avuto origine dalla lettura dell'articolo pubblicato nel 1956 da Kanizsa, al quale dedico affettuosamente questa nota. Quell'articolo è una piccola miniera che contiene ancora dei giacimenti inesplorati, o almeno non esplorati a fondo.



a b

Fig. 2

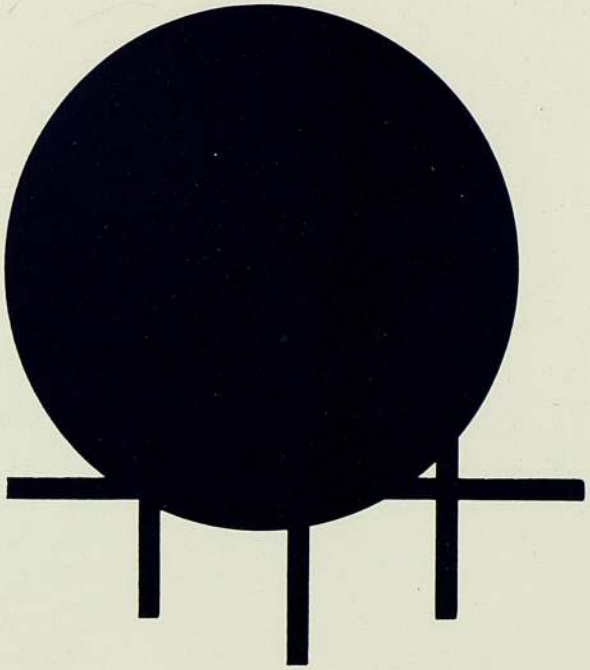
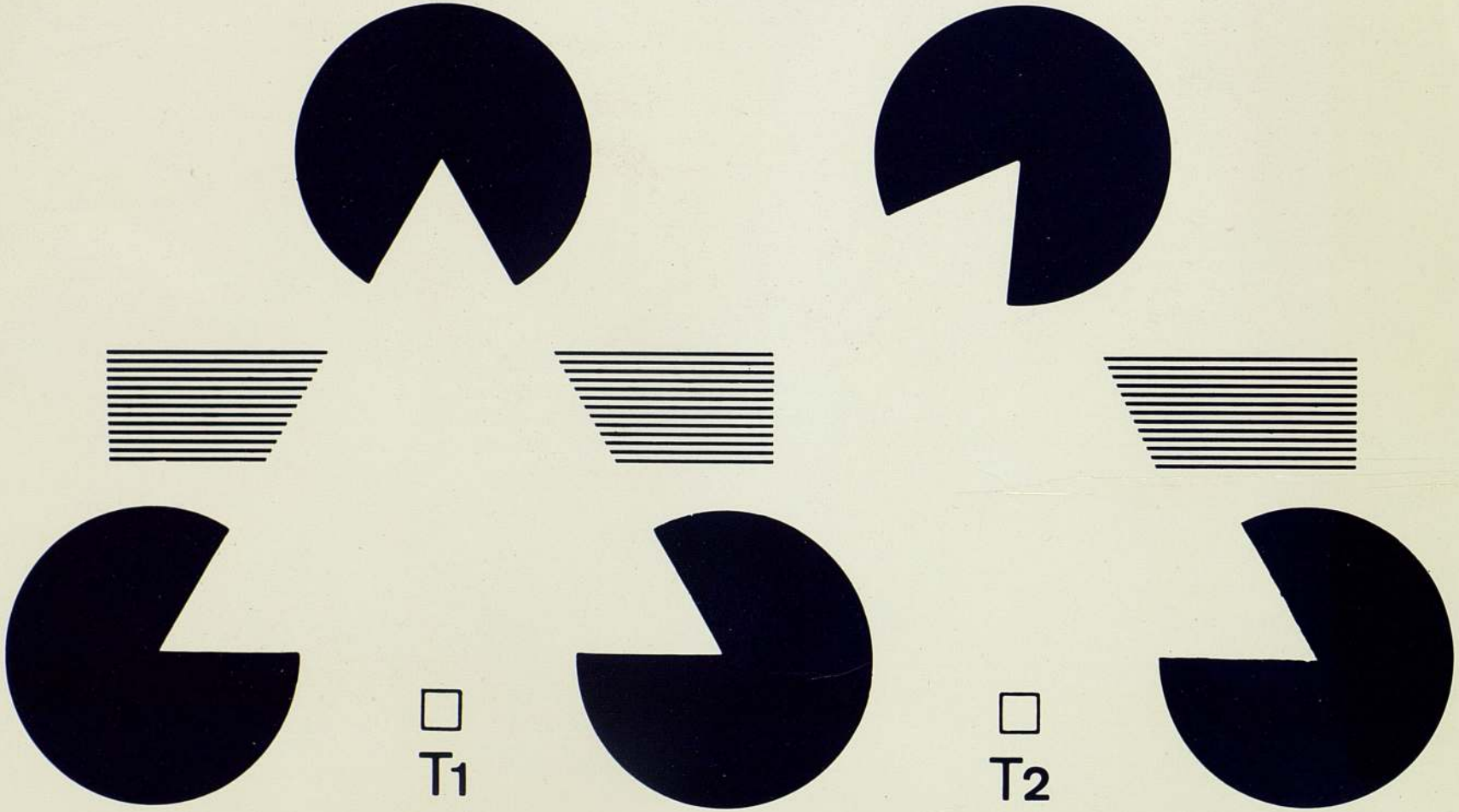
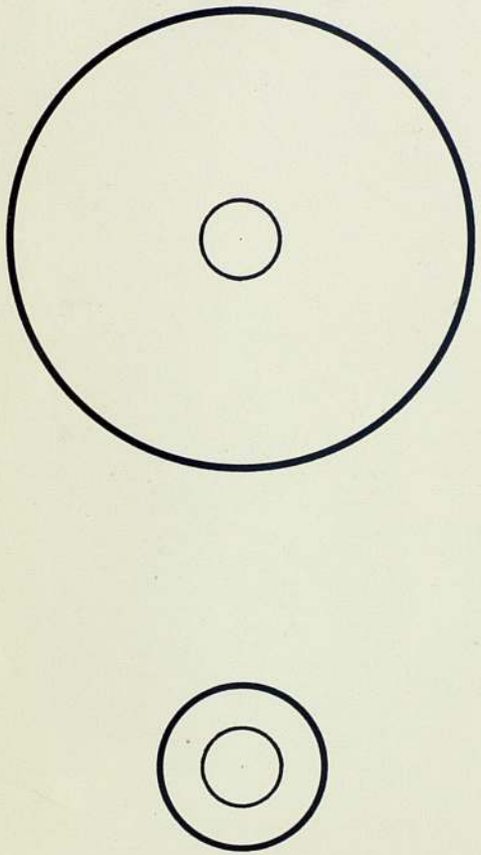
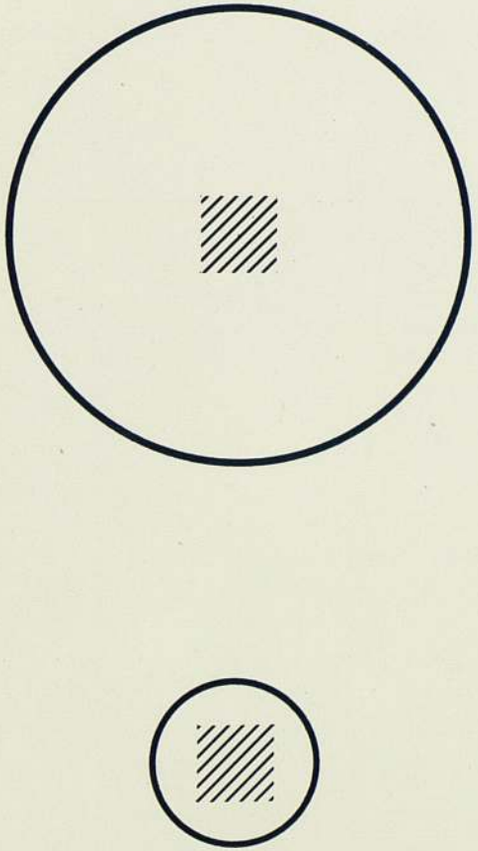


Fig. 1


T1
T2



A



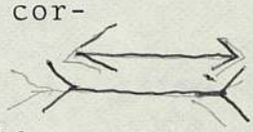
B

fig. 17

Fabio Metelli

The function of the perceptual illusions in research

Having to speak about perceptual illusions, it seems well to begin with a definiction. We speak of an illusion when the attributes of a perceived configuration differ from the corresponding characteristics of the target.



Let us give an example: the paper with the drawing is the target, and the a and b segments are equal as I draw them egual; but in the perceptual configuration they are unegual.

There are two ways of considering perceptual illusions. The more common one is to consider them exceptions, where our perceptual apparatus did not function well, and therefore it did not give us, as it always does, ~~trustworthy~~ ~~truthful~~ veridical information about the real world.

The other way is considering them as alarm signals, breaks in the cuirass of our naive realism, through which the difference between perceptual and real world becomes directly visible.

There is a natural tendency towards naive realism, that is to ignore the above difference and to think that what we see is the real world.

There are several ways to preserve our realism.

So f. ex. when in a car accident the driver says that he did not see the person crossing the way. What is meant in this statement is that he did not direct his look or his atten-

tion to the person: in other words, his perceptual apparatus did function well, only it had not been used the right way.

~~Perceptual illusions are important, because~~ with perceptual illusions this type of explanation does not function.

Let us take the famous example of the Ganzfeld. There is a very big homogeneous wall in front of me and I see fog. No change of attention and of gaze direction helps. We have to explain why we do not see the wall, although it is in front of us.

We begin with looking for the solution of a special phenomenon. But soon or late our scope widens. The problem becomes more general. Why do whe see awall when there is a wall? Why do we see the color condensed on a surface, and empty transparent space before it?

In other words not only the illusory perception but also the truthful one puts a problem.

This is the thesis I intend to illustrate with some examples: the function of perceptual illusions is to show us that the perceptual world is a set of problems to be discovered first and then to be studied and solved. My examples should show how, studying illusions, from a limited special problem a wider insight develops.

a) Transparency

My first example is transparency. First of all I have to

meet ~~the~~ a natural objection, that the conditions for perceiving transparency are physical, that transparency is a physical and not a perceptual phenomenon. Than let us do a little experiment. (I) Do you see something transparent here?

Well, there is nothing physically transparent here, only a mosaic of opaque pieces of cardboard. And here? (II) Certainly not. But in fact the red plastic is physically transparent (III) ~~So, I reached two results. First of all~~ So I showed that physical transparency is neither a necessary nor a sufficient condition for perceiving transparency. Obviously because the visual system does not receive any information whether the light rays stimulating the retina are paesing through a transparent layer or not. Second, therefore we can study the perception of transparency either whith ~~apparent or~~ apparently but not really transparent targets or in conditions of physical transparency, at will.

Then, what gives rise to the impression of transparency? Let us do a little demonstration (IV) Now you see transparency where there was not. This experiment shows that transparency depends on a complex stimulation, as local stimulation remained the same ~~diel not change~~.

Having reached the proof that there is no link between physical and perceptual transparency, it is justified to study the perception of transparency either under conditions of physical transparency, or under conditions of apparent transparency In other words, the phenomenon being studied

target, display

does not regard just an illusion, but a ~~thrustworthy~~ truthful perception as well. According to the opportunity (that is, according to the conditions having to be studied) the illusory perception or the ~~thrustworthy~~ truthful perception can be used ~~as a display~~ for research. And so we did, studying the spatial and the chromatic conditions of the perception of transparency.

b) Apparent rest

These is a typical example of a special problem widening into a general one: the phenomenon I called apparent rest.

(V) (VI) No time to do the experiment properly. People has ~~in general~~ that is a coercive impression of a resting circle successively visible in all of its parts, while in fact, the whole configuration is rotating.

a) I met this type of phenomenon as others did, working with a Maxwell disk; the first step of my study was looking for the necessary conditions. Through systematic variation I found that there was only one necessary condition: one part of the border has to correspond to the trajectory of a point. (The illusion can be obtained with rectilinear motion also).

b) ~~After years, having the impression not having~~ In order to find an explanation ~~that I had not~~ explained of the phenomenon, I ~~got to~~ put a new question "which modification on the proximal stimulation (retina) are caused by the motion of ~~one of~~ the above target and ~~!~~!" Let us take a symple target and ~~let us~~ consider a symplified drawing (VII) Throngh rotation the retinal region stimulated by the a stimulus is decreasing

But with the search of the necessary conditions only the first step of the research has been done.

In order to find an explanation of the phenomenon it is opportune to consider what happens at the level of the sense organ.

Let us consider a simpler case. What happens at the retinal pro= jection level when a homogeneously colored figure is moving on a homogeneous, but differently colored ground. There is a homogeneously stimulated region, which is shrinking on one side, and widening on the other side. Of course, the stimulation originated from the ground widens and shrinks in the opposite way.

The same happens with our display: as it is turning, the stimulation originating from the semicircle decreases on one side and increases on the other, and the opposite happens of the stimulation originating from the rectangle.

But what happens if instead of using the illusory display, we use a rectangle rotating on a stady circle? It is easy to see that the stimu= lation is the same in both cases. And if the stimulation is the same, the perception is obviously the same. But there is still a problem: why do we see, in both cases, a stady circle and a rotating rectangle? Why not the whole configuration rotating?

From the preceding analysis it was clear that on the re= tinal level there is not motion but only increasing and decreasing of ho= mogeneously stimulated regions. But the borders, that is the lines of abrupt change between differently stimulated regions, behave differently: they are resting or shifting; So for example, the border of the circle is re= sting - although it decreases on one side and increases on the other - while the border of the rectangle is shifting. We shall call the last ones kinetically active borders (because shifting borders give rise to the per= ception of motion) and the resting ones, kinetically non active.

What about our display? The part of the border corresponding to the trajectory of a point, the semicirular one, is kinetically non active, and the remaining one is kinetically active. The border of the display is kinetically inhomogeneous. And as a result the configuration splits in two figures, the circle and the rectangle, each with kinetically homogeneous borders.

The tendency towards kinetically homogeneous borders, which was hypotyzed here, is commonly acting inour visual world. ~~When a figure is moving in front of a steady one,~~

border of the resting figure is increasing and decreasing but not shifting.

d) Now let us go back to our illusory figure. What happens of the borders of the apparently resting part of the configuration? They are increasing and decreasing, but resting, as the borders of the resting figure do. Then, in the special case of our figure, as in the general case of moving and resting objects, we have two types of borders, wich we shall call kinetically active and kinetically not active: the firstones only are giving rise to the perception of a moving figure.

Our configuration gives rise to a retinal projection with both type of borders: in other words its borders are kinetically non homogeneous. And what happens: the configuration splits ~~shifts~~ into two figures, each with kinetically homogeneous borders. The tendency through kinetically homogeneous borders is all but exceptionally acting. Every time when a moving figure is passing in front of a resting one, a similar situation is arising at the retinal projection level: we are faced with a configuration with kinetically inhomogeneous borders. And instead of a calendoscopic widening and shrinking of figures, through the tendency towards kinetical homogeneity of borders, a figure moving in front of a resting figure is perceived.

c) The disappearing hole

Demonstration: what do you see. Touch the rectangles beginning with the right one. (Demonstration without apparatus).

We begun to study the phenomenon as always, with varying conditions systematically; the only necessary condition resulted to be the homogeneity of the surface behind the hole.

Than, as usual, wa considered the proximal stimulation, and it appeared that there was a difference between a piece of paper pasted on a cardboard, and a hole, only if the insides of the hole was inhomogeneous. In this case the difference was caused by retinal disparity (i.e. the location of the background of the hole on a different plane) and difference in focusing. Otherwise there was no difference; and also in this case the problem seemed to disappear.

But there is still a question to be asked. Why do we see a paper pasted on a cardboard and not a hole? There is a well known quality of the border, the one-sided function of the border, that normally outlines only insides and not outsides. But why the border is acting this way, is still an open question. And then a strange exception still unexplained: if the insides of the hole is black, not withslanding its homogeneity, it is perceived as a hole.

Research on this field has been carried on by professor Da Pos, who discovered a strange log phenomenon and by dr. Cavedon who has been able to obtain the opposite phenomenon, the perception of a non existing hole.

ZWINGEND Schlüsse ziehen

Notwendige - ausreichende Bedingung

der Effekt der Realismus der Apparat

Durchbruch

geradlinige Bewegung

das Phänomen das Beispiel

der Kreis

das Rechteck

das Loch

gerade

Forschung Ruhm schmeichelhaft verdienen

Vortrag

Pflichten reichen einladen verehren

Bewunderung Annäherung

komisch

I spoke about this topic several times, mainly abroad (USA, India, Austria), but always with demonstrations, ~~which~~ assuring raised some interest.

Some ~~dear~~ current friends expressed the opinion that I should publish my talk. I have yielded to their encouragement although ~~such~~ such a paper has the big handicap of the lack of demonstrations which were, I think, the more attractive part of my talk. I remember with amusement that I was forced for necessary reasons of a very dense program, to compress talk and demonstrations in a 10 minutes time at the last International Conference on Perception at Castelvecchio Pascoli, near Pisa. I succeeded but I don't know how.

THE FUNCTION OF PERCEPTUAL ILLUSIONS IN RESEARCH ☆

by
Fabio Metelli
University of Padova (Italy) Dept of Psychology

As the subject of this paper are perceptual illusions, it is perhaps useful to begin with a definition. According to Professor Rausch it is a case to speak of a perceptual illusion when the attributes of a perceived configuration differ from the corresponding characteristics of the target.

I give an example from the well known geometric optical illusions (Muller-Lyer, Fig.1) in order to clarify the meaning of the concepts of target and perceptual configuration. (1) But the demonstrations described and discussed in this ~~describations discrepancy in was~~ paper will not concern the geometric-optical illusions.

==========

FIGURE 1

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At this point it this quite natural to ask the following question. Why have the perceptual illusions an important place in ~~almost every handbook of~~ Psychology? Are not illusions unimportant little problems which ~~only a pedant can choose as object of research~~?

Such a radical point of view was represented by James Gibson ~~a dear friend of mine who died years ago~~. We discussed several times this topic, the last time some months before his end.

At my opinion there is a special reason to stress the importance of perceptual illusions. I shall begin with stating briefly my theoretical standpoint. However the main part of this paper will consist in demonstrating and discussing some phenomena which will serve to illustrate the theory.

At the beginning of experimental research in Psychology, but not only at the beginning, but often also ~~verlhaps~~ nowdays, the illusions were considered as exceptions, where our sensory apparatus did not function well, and therefore did not give, as it always do, true and trustworthy information about the real world. They were studied and are still ~~introduced~~ studied as interesting special problems.

A point of view that never has been completely put aside is that the sensory apparatus cannot lie, and therefore higher functions have been looked for, interfering with sensory data and being the origins of perceptual illusions.

It is however possible to consister perceptual illusions in a quite different way. According to this point of view they are considered alarm signals, breaks in the cuirass of our maive realism, through which the difference between perceptual and real becomes directly visible.

The very function of perceptual illusions is to force us to see a problem where before there seemed to be no problem at all.

It has been always very interesting for me to ascertain that not only the layman, the ordinary man, but also the specialist who founded all his research on the difference between

perceptual and real, falls back in his common life and behavior, to maive realism in an absolutely natural way. What he ~~needs~~ sees is a car and not a ~~maculat~~ moment he is thinking that it is the percept~~ion~~ual image of a car.

It is necessary, in order to live a normal life, to ignore or at least to disgregard the difference between perceptual world and reality (behavioral and geographical environment, according to Koffka's original concepts). (2)

We have a typical way to defend ourselves and to preserve our realism. If we stumble in a step we simply say that we did not see or did not notice it. And in the same way we do often explain the tragis happening of a car accident: we did not see the person. It is clear that, according to the previous ~~instruction~~ distinction between behavioral (or perceptual) and geographical (or real) environment, the step, or the person did not exist in our perceptual world. But with our explanation we are meaning that we should have been able to see the object under~~estimation~~ discussion, if we had only changed the direction of our look, or if we had changed the concentration of our attention. What we mean is that the perceptual apparatus was functioning exactly but we did not use it in the right way.

But ~~they~~ there are cases, and these are just the perceptual illusions, where this explanation does not ~~old~~ hold. In these cases, direction of look and attention ~~we~~ do not help to perceive what really is there.

Let us take as an example the famous Ganzfeld experiment ~~of~~ discovered by

Wertheimer ~~and~~ studied by Metzger. There is a wall in front of us, and we see just fog. In this case there is no way to escape the problem, to make disappear the phenomenon. Change in attention or in directing the look does not change what we are seeing. This type of phenomena generates a crisis of our naive realism.

We have to explain why we do not see the wall, although it is a front of us. Our first attitude in these cases is to look for a solution of the illusion as a special limited phenomenon. What we ask is: why did not our peripheral apparatus regularly function in this special case although as a rule it gives us a true reproduction of reality?

This is the natural way to follow, at first, for every perceptual illusion. It is like we behave if in an old building: a piece of plaster falls from a wall and we get it repaired so that the color is almost eterogeneous and for the superficial ovewer there is no fault to see. The same can happen a secord, a third time. But sooner or later the whole plaster falls, and with big amazement and happiness we discover that a fresco was hidden under the plaster.

~~Something similar happens, soomer or later, when a perceptual illusion in studied.~~

Let us go back to the Ganzfeld-Phenomenon. The first, and more natural question is "Why don"t we see the wall? But suddenly - after a more or less long delay - we discover that this is only a partial problem. Then we ask ourselves not only under which conditions we see fog instead of a wall, but also

under which conditions do we see a wall, when a wall is really in front of us. Why do we see, in this case, the color condensed on a surface in front of us, and before it a colorless transparent space? And why does the problem concern only the wall? under which condition do we see a chair, a desk, a book when these objects are being in front of us?

In this sense the perceptual illusions are precious signals forcing us or aiding us to acknowledge a problem where there seemed to be no problem and every thing appeared ~~so~~ to be obvious. In this sense the perceptual illusions took an important part to the birth of the modern Perception psychology and convinced us Perception psychologists (I think at least the majority of us) that the perceptual world - the only world with which we have direct contact - is all a set of problems, which have to be discovered - and this is often the most serious difficulty - before trying to solve them.

With this assertion I am ending the first part of my paper. Now I'll try to show - using as examples some perceptual illusions which have been observed and studid by my collaborators and me, the development of the problems according to what I said before, that is to show ~~hers~~ how from a limited special problem a wider insight develops.

APPARENT TRANSPARENCY

Apparent Transparency

My first example of a perceptual illusion is apparent transparency. Of course, studying the perception of transparency we have to answer a natural objection. Transparency is not a perceptual but a physical problem, we perceive transparency when a physical object is permeable to the light. Therefore we have to begin showing that physical transparency is neither a necessary nor a sufficient condition for perceiving transparency.

==========

FIGURE 2

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The display represented in Fig. 2 is generally perceived as transparent. But there is nothing physically transparent there. It is just a mosaic of opaque pieces of cardboard of different color. So, physical transparency is not a necessary condition for perceiving transparency, or in other words, there are cases of apparent transparency. On the contrary, nobody perceives transparency in the display of Fig. 3, While the red plastic which is glued upon a white cardboard is physically transparent.(3) And this proovs that physical transparency is not a sufficient conditione to perceive transparency.

==========

FIGURE 3

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But thinking of the stimulation originating the perception of transparency it is clear that the visual system does not receive any information about the conditions giving rise to ~~it,~~ transparency, namely if the light rays stimulating the retina passed or not through a transparent medium.

How do we study perceptual transparency? As every other perceptual phenomenon, changing the conditions systematically, especially the colors and the forms of the surfaces giving rise to it. Following this way ~~my collaborators and I~~ we have been able to formulate mathematically ~~the necessary~~ some conditions of the perception of transparency.

But here I have to confine myself to a little demonstration, which is in a way typical as it shows an important aspect of the phenomenon. Putting the two displays 3 and 3a together in such way that there is continuity between the borders of the plastics, transparency is perceived. We are forced to draw the conclusion that transparency depends on a complex stimulation of the visual organ. It is what we call a gestalt phenomenon, or in other words it does not depend on local stimulation, which in our example did not change.

But the conclusion of our demonstration is that the ~~necessary~~ conditions of perceptual transparency, although studied starting from cases of apparent transparency, are valid

also in the more common case, when physical and perceptual transparency coincide. The problem has widened, it is not more the problem of the conditions of apparent transparency, but the general problem of the perception of transparency without restriction.

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FIGURE 3a

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FIGURE 4

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APPARENT REST

A much more striking example where from a special problem a wider insight develops is the perceptual effect I called apparent rest. If the display reproduced in Fig. 5 is rotated slowly around the center of the semicircle, (4) what we see is a complete resting disk with a series of circles inside, which is periodically covered and uncovered by a rectangle turning on it. If the display of Fig. 6 is rotated slowly around the

center of the inside arc, we see a resting circle periodically covered and uncovered by a peripherically located circle rotating on it.

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FIGURE 5

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The phenomenon was observed by Wittmann (1920) and by Werner and Wildhagen (1929) on fusing two colors with the Maxwell disk (Fig. 7). When the current is interrupted, the rotating disk slows down till resting. When the speed is little, one sees one sector (the minor one) rotating upon a steady disk.

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FIGURE 6

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Strange enough, the above authors did not change sistematically the form of the display but sticked to the Maxell disk. Wittman (5) tried to give an explanation of the phenomenon, asserting that when the subject concentrates on the motion of the minor ~~action~~ sector, the major closes in a circle. An explanation which is evidently wrong, because as more the subject concentrates its attention on the apparently nesting circle, as greater the evidence of the phenomenon (6) of apparent rest.

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FIGURE 7

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1. Changing systhematically the shape of the display, I discovered immediately that the Maxwell disk was the worst display for demonstrating the phenomenon and that the only necessary condition was that at least one part of the contour corresponds to the trajectory of a point. It is therefore perhaps opportune to stress that the phenomenon is not limited to the rotatory motion but can be obtained with translatory motion as well.

A typical example of apparent rest with translatory motion is obtained with apparatus ~~of~~ sketched in Fig. 8, while the reverse of the phenomenon is what we observe traveling with a train when we see the telegraph poles moving, while the ~~rails~~ wires are resting.

2. But the problem can be seen from another angle, that is from the point of view of the retinal stimulation.

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FIGURE 8

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Then the new question is: which modifications on the proximal stimulation are caused by the motion of the target?

Let us try to give a very raw ~~c~~description of it.(7)

It is easy to see that when the target, made of two differently colored regions, rotates, the region stimulated by stimulus a decreases from one side and increases from the other; and the contrary happens to the region stimulated by the b stimulus. The result is that we are perceiving the b region moving upon a steady complete circle.

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FIGURE 9

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But what happens on the proximal stimulation if we imitate with the target what we were perceiving, that is if we use as a target a steady circle upon which a rectangle is turning? (7) Then we see, to our surprise, that what happens on the retinal projection is exactly the same; the a region is increasing on one side and decreasing on the other, and the contrary happeness to the b region. Therefore, as the stimulation is the same in both cases, the perception is necessarily the same. ~~on both cases, the perception is necessarily the same~~.

The explanation is very simple and there is no more problem. Our problem seems to have disappeared.

3 However, a more through analysis shows that not everything has been explained. Because, while it is clear that, the stimulation being the same, the perception has to be the same,

it is by no means clear why we perceive in both cases a figure rotating and a resting one, and not the whole configuration rotating. In other words, why do we see in both cases a rectangle turning on a resting complete circle and not half circle rotating together with a rectangle?

It is interesting to point out that the problem has widened: it no more regards the illusion only, but the non-illusory situation also.

4. Than we are faced with a more general problem: what happens on the retina when an object is moving upon a ground?

a) to study a typical example, let us simplify the case considering an homogeneously colored figure moving in front of a differently homogeneously colored ground (Fig. 10).

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FIGURE 10

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The reslt - on the proximal stimulation - is that an homogeneously stimulated region corresponding to the figure is increasing on one side and decreasing on the other, while the contrary is happening to the other homogeneously stimulated region corresponding to the ground. Then, there are two homogeneously stimulated regions that are increasing on one side and decreasing on the other - they are both non moving. So there seems to be no motion at all on the retina. But there is

something - the border between the two regions, - that is the abrput jump of stimulation between one region and the other— which is wandering.

b) ~~Not~~ Now let us consider the encounter of the moving figure with another (still differently colored but homogeneous) figure, which is resting. We are interested in two different possibilities. Either (1) the moving figure is passing behind the resting figure, or (2) in front ~~for~~ of it.

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FIGURE 11

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(1) At the moment of the encounter, the stimulation corresponding to the moving object is decreasing on one side and immediately or after a while increases on the other side, on the expense of the ground. But (2) as it passes in front of the figure it is the resting figure which decreases on the same side, but this time at the profit of the stimulation corresponding to the moving figure, while immediately or after a time on the other side it is growing at the expese of the stimulation corresponding to the ground.

While in the first case (1) the moving figure was shrinking (because it was decreasing on one side ~~which~~ while remaining unchanged on the other side) till sometimes disappearing and then widening, in the second case (2), that is, when the figure was moving in front of the resting figure, it is the resting

figure that shrinks at the beginning, than sometimes disappears and then widens till regaining her prior size and form.

The moving as well as the resting figure are both giving rise to increasng and the decreasing of homogeneously stimulated regions, not to motion. But what about the borders? We see that there are borders between homogeneously stimulated regions that are resting and borders that are shifting. The borders of the retinal projection of the steady figure are steady while the borders of the moving figure are shifting.

5. Now let us go back to our illusion. What happens of the borders of the retinal projection of the apparently resting part of our configuration? They are decreasing on one side and ~~de~~creasing increasing on the other (as the borders of the retinal projection of the steady figure do, when it is covered or uncovered by the moving figure), but they are resting as the borders of the steady figure do.

So we are faced with two types of borders, the shifting borders of the retinal projection of the moving figure, which we shall call kinetically active borders and the resting borders of the projection of the steady figure (as well as those of the projection of the apparently resting figure of the illusory configuration,) which we shall call kinetically non-active borders.

But let us see what happens when a configuration (an object like our target) has some of the borders which are kinetically active, and some kinetically unactive, that is it has

kinetically unhomogeneous borders. What happens in this case is our illusory reslt: the configuration splits in two objects, each of them with kinetically homogeneous borders.

But this case is all but exceptional. Every time when a moving figure is passing in front or at the back of a resting figure, a similar situation can arise at the retinal projection's level, ~~an object moves in front or behind another object~~, giving rise to a configuration with kinetically inhomogeneous borders. Through ~~the~~ a tendency towards kinetically homogeneous borders a moving figure wandering in front or behind a resting one is seen.

So, when an object is moving in a field of resting objects, instead of a caleidoscopic change of widening and strinking figures, through the tendency to kinetically homogeneous borders, the real thing is perceived.

THE DISAPPEARANCE OF A HOLE

The third example of a problem regarding an illusion, whose study appears to be interesting above the mere illusion, is the problem of the perception of a hole.

The illusion is simply demonstrated, without any apparatus.

We only need a cardboard with a hole in its central region, through which we see a part of an homogeneous region of different color. The hole, if the surface behind it is homogeneous, is not perceived as a hole, but as a figure, plasted on the cardboard, having as borders the borders of the hole. Varying every condition (form, size, color) we see that although there are conditions favoring or hindering the phenomenon - Dr Cavedon made a qualitative study of it - it resulted that the only necessary ~~one~~ condition to obtain the illusion appeared to be the homogeneity (8) of the surface visible through the hole. But we ~~already learned the lesson~~ know that what really matters is not what happens on the target, but the stimulus conditions at the retinal level. Here we see that there is a difference between the stimulation provided by a piece of paper of different color attached on a screen and a hole in the screen, only if the bottom of the hole is not homogeneous, but there is no difference if the hole is homogeneous, because in this case here is nothing that could give rise to retinal disparity, or to differential focussing, that is to depth perception. Again the problem seems to have disappeared.

Bur there is a problem unsolved in this case also: why do we see, in both cases, a paper attached on the surface and not a hole? The question seems to be solved by the onesided functioning of the border, the border being perceived as a part of the included and not of the including region of the field - a discovery due to Rubin and Koffka. But again, why is the

border functioning this way? And than, a strange exception. If the insides of the hole is deep black, notwithstanding its perfect homogeneity, it is perceived as a hole.

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FIGURE 12

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So there are still several unanswered questions. The research in this field has been carried on by Prof. Da Pos and by Dr. Cavedon, Prof. Da Pos having observered a very interesting effect of apparent fog, and Dr. Cavedon having been able to obtain the opposite effect, putting on light some special conditions giving rise to the perception of a hole, when no real hole exists.

SUMMARY

The function of perceptual illusions in research is iscussed and demonstrated analysing three perceptual illusions observed and studied by the Author: the apparent transparency, the apparent rest and the disappearing of a hole.

NOTES

1. In the target the parallel segments of the Muller-Lyer figure are equal, ~~which~~ while in the perceptual configuration they are unequal.

2. K. Koffka, Principles of Gestalt Psychology, Cap.II.

3. The color can be varied without any effect on the phenomenon.

4. If the display is reproduced in normal size (radius about 15 cm) the effect can be observed at home, using a turnable for records.

5. I was not able to retrace, either asking Professor Werner hymself or at Hamburg University, W. and W.'s paper.

6. This shift of attention succeeds easier with display of Fig. 5 or 6.

7. We confine us ~~observer's task~~ to take into consideration Fig. 5, for the sake of simplicily.

8. Often this symple demonstration does not suceed because the surface behind the hole is not really homogeneous (if it is a wall, there are shadows on it). But Prof. Da Pos constructed a symple gadget, with constant illumination, which makes coercive for every subject the disappearance of the hole.

THE FUNCTION OF PERCEPTUAL ILLUSIONS IN RESEARCH

As the subject of this paper are perceptual illusions, it is perhaps useful to begin with a definition. According to Professor Rausch it is a case to speak of a perceptual illusion when the attributes of a perceived configuration differ from the corresponding characteristics of the target.

I give an example from the well known geometric optical illusions (Muller-Lyer, Fig.1) in order to clarify the meaning of the concepts of target and perceptual configuration. (1) But the demonstrations describet~~ions~~ and discussed ~~discrepancy~~ in ~~was~~ this paper will not concern the geometric-optical illusions.

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FIGURE 1

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At this point it ~~this~~ is quite natural to ask the following question. Why have the perceptual illusions an important place in ~~almost every handbook of~~ Psychology? Are not illusions unimportant little problems which only a pedant can choose as object of research?

Such a radical point of view was represented by James Gibson ~~a dear friend of mine who died years ago.~~ We discussed several times this topic, the last time some months before his end.

At my opinion there is a special reason to stress the importance of perceptual illusions. I shall begin with stating briefly my theoretical standpoint; however the main part of this paper will consist in demonstrating and discussing some phenomena which will serve to illustrate the theory.

At the beginning, but not only at the beginning, but often also ~~verhaps~~ nowdays, the illusions were considered as exceptions, where our sensory apparatus did not function well, and therefore did not give, as it always do, true and trustworthy information about the real world. They were studied and are still introduced as interesting special problems.

A point of view that never has been completely put aside ~~in~~ is that the sensory apparatus cannot lie, and therefore higher functions have been looked for, interfering with sensory data and being the origins of perceptual illusions.

It is however possible to consider perceptual illusions in a quite different way. According to this point of view they are considered alarm signals, breaks in the cuirass of our maive realism, through which the difference between perceptual and real becomes directly visible.

The very function of perceptual illusions is to force us to see a problem where before there seemed to be no problem at all.

It has been always very interesting for me to ascertain that not only the layman, the ordinary man, but also the specialist who founded all his research on the difference between

perceptual and real, falls back, in his common life and behavior, to maive realism in an absolutely natural way: what he ~~needs~~ sees is a car and not a ~~maculat~~ moment he is thinking that it s the perception of a car.

It is necessary, in order to live a normal life, to ignore or at least to disgregard the difference between perceptual world and reality (behavioral and geographical environment, according to Koffka's original concepts). (2)

We have a typical way to defend ourselves and to preserve our realism. If we stumble in a step we simply say that we did not see or did not notice it. And in the same way we do often explain the tragis hapening of a car accident: we did not see the perosn. It is clear that, according to the previous ~~instruction~~ distinction between behavioral (or perceptual) and geographical (or real) environment, the step, or the person did not exist in our perceptual world. But with our explanation we are meaning that we should have been able to see the object under~~estimation~~ discussion, if we had only changed the direction of our look, or if we had changed the concentration of our attention. What we mean is that the perceptual apparatus was functioning exactly but we did not use it in the right way.

But ~~they~~ there are cases and these are just the perceptual illusions, where this explanation does not hold. In these cases, direction of look and attention ~~we~~ do not help to perceive what really is there.

Let us take as an example the famous Ganzfeld experiment of

Wertheimer ~~and Metzger~~. There is a wall in front of us, and we see just fog. In this case there is no way to escape the problem, to make disappear the phenomenon. Change in attention or in directing the look does not change what we are seeing. This type of phenomena generates a crisis of our naive realism.

We have to explain why we do not see the wall, although it is in front of us. Our first attitude in these cases is to look for a solution of the illusion as a special limited phenomenon. What we ask is: why did (not our) peripheral apparatus regularly function in this special case although as a rule it gives us a true reproduction of reality?

This is the natural way to follow, at first, for every perceptual illusion. It is like we behave if in an old building: a piece of plaster falls from a wall and we get it repaired so that the color is almost homogeneous and for the superficial observer there is no fault to see. The same can happen a secord, a third time. But sooner or later the whole plaster falls, and with big amazement and happiness we discover that a fresco was hidden under the plaster.

Something similar happens, soomer or later, when a perceptual illusion in studied.

Let us go back to the Ganzfeld-Phenomenon. The first, and more natural question is "Why don"t we see the wall? But suddenly - after a more or less long delay - we discover that this is only a partial problem. Then we ask ourselves not only under which conditions we see fog instead of a wall, but also

under which conditions do we see a wall, when a wall is really in front of us. Why do we see, in this case, the color condensed on a surface in front of us, and before it a colorless transparent space? And why does the problem concern only the wall? under which condition do we see a chair, a desk, a book when these objects are being in front of us?

In this sense the perceptual illusions are precious signals forcing us or aiding us to acknowledge a problem where there seemed to be no problem and every thing appeared ~~so~~ to be obvious. In this sense the perceptual illusions took an important part to the birth of the modern perception psychology and convinced us perception psychologists (I think at least the majority of us) that the perceptual world - the only world with which we have direct contact - is all a set of problems, which have to be discovered - and this is often the most serious difficulty - before trying to solve them.

With this assertion I am ending the first part of my paper. Now I'll try to show - using as examples some perceptual illusions which have been observed and studid by my collaborators and me, the development of the problems according to what ~~I~~ we said before, that is to show ~~hers~~ how from a limited special problem a wider insight develops.

APPARENT TRANSPARENCY

Apparent Transparency

My first example of a perceptual illusion is apparent transparency. Of course, studing the perception of transparency we have to answer a natural objection. Transparency is not a perceptual but a physical problem, we perceive transparency when a physical object is permeable to the light. Therefore we have to begin showing that physical transparency is neither a necessary nor a sufficient condition for perceiving transparency.

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FIGURE 2

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The display represented in Fig. 2 is generally perceived as transparent. But there is nothing physically transparent there. It is just a mosaic of opaque pieces of cardboard of different color. So, physical transparency is not a necessary condition for perceiving transparency, or in other words, there are cases of apparent transparency. On the contrary, nobody perceives transparency in the display of Fig. 3, while the red plastic which is glued upon white cardboard is physically transparent.(3) And this proovs that physical transparency is not a sufficient conditione to perceive transparency.

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FIGURE 3

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But thinking of the stimulation originating the perception of transparency it is clear that the visual system does not receive any information about the conditions giving rise to it, namely if the light rays stimulating the retina passed or not through a transparent medium.

How do we study perceptual transparency? As every other perceptual phenomenon, changing the conditions systematically, especially the colors and the forms of the surfaces giving rise to it. Following this way ~~my collaborators and I~~ we have been able to formulate mathematically the ~~necessary~~ conditions of the perception of transparency.

But here I have to confine myself to a little demonstration, which is in a way typical as it shows an important aspect of the phenomenon. Putting two displays 3 and 3a together in such way that there is continuity between the borders of the plastics, transparency is perceived. We are forced to draw the conclusion that transparency depends on a complex stimulation of the visual organ. It is what we call a gestalt phenomenon, or in other words it does not depend on local stimulation, which did not change. Fig. 3A Fig 4

~~But~~ The conclusion of our demonstration is that the ~~necessary~~ conditions of perceptual transparency, although studied starting from cases of apparent transparency, are valid

also in the more common case, when physical and perceptual transparency coincide. The problem has widened, it is not more the problem of the conditions of apparent transparency, but the general problem of the perception of transparency without restriction.

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FIGURE 3a

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FIGURE 4

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APPARENT REST

A much more striking example where from a special problem a wider insight develops is the perceptual effect I called apparent rest. If the display reproduced in Fig. 5 is rotated slowly around the center of the semicircle (4) what we see is a complete resting disk with a series of circles inside, which is periodically covered and uncovered by a rectangle turning on it. If the display of Fig. 6 is rotated slowly around the

center of the inside arc, we see a resting circle periodically covered and uncovered by a peripherically located circle rotating on it.

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FIGURE 5 Figure 6

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The phenomenon was observed by Wittmann (1920) and by Werner and Wildhagen (1929) on fusing two colors with the Maxwell disk (Fig. 7). When the current is interrupted, the rotating disk slows down till resting. When the speed is little, one sees one sector (the minor one) rotating upon a steady disk.

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FIGURE 6

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Strange enough, the above authors did not change sistematically the form of the display but sticked to the Maxwell disk. Wittman (5) tried to give an explanation of the phenomenon, asserting that when the subject concentrates on the motion of the minor ~~action~~ sector, the major closes in a circle. An explanation which is evidently wrong, because as more the subject concentrates its attention on the apparently nesting circle, (not on the moving object) as greater the evidence of the phenomenon (6).

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FIGURE 7

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2. Changing systhematically the shape of the display, I discovered immediately that the Maxwell disk was the worst display for demonstrating the phenomenon and that the only necessary condition was that at least one part of the contour corresponds to the trajectory of a point. It is therefore perhaps opportune to stress that the phenomenon is not limited to the rotatory motion but can be obtained with translatory motion as well.

A typical example of apparent rest with translatory motion is obtained with apparatus of Fig. 8. While the reverse of the phenomenon is what we observe traveling with a train when we see the telegraph poles moving, while the rails are resting. 2. But the problem can be seen from another angle, that is from the point of view of the retinal stimulation.

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FIGURE 8

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Then the new question is: which modifications on the proximal stimulation are caused by the motion of the target?

Let us try to give a very raw deseription of it.(7)

It is easy to see that when the target, made of two differently colored regions, rotates, the region stimulated by stimulus a decreases from one side and increases from the other; and the contrary happens to the region stimulated by the b stimulus. The result is that we are perceiving the b region moving upon a steady complete circle.

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FIGURE 9

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But what happens on the proximal stimulation we imitate with the target what we were perceiving, that is if we use as a target a steady circle upon which a rectangle is turning? Then we see, to our surprise that what happens on the retinal projection is exactly the same, the A region is increasing on one side and decreasing on the other, and the contrary happeness to the B region. Therefore, as the stimulation is the same in both cases, the perception is necessarily the same. ~~on both cases, the perception is necessarily the same.~~

The explanation is very simple and there is no more problem. Our problem seems to have disappeared.

3. However, a more through analysis shows that not everything has been explained. Because, while it is clear that, the stimulation being the same, the perception has to be the same,

it is by no means clear why we perceive in both cases a figure rotating and a resting one, and not the whole configurating rotating. In other words, why do we see in both cases a rectangle turning on a resting complete circle and not half circle rotating together with a rectangle?

It is interesting to point out that the problem has widened: it no more regards the illusion only but the non-illusory situation also.

4. Than we are faced with a more general problem: what happens on the retina when an object moving upon a ground?

a) to study a typical example, let us simplify the case considering an homogeneously colored figure moving in front of a differently homogeneously colored ground (Fig. 10).

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FIGURE 10

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The reslt - on the proximal stimulation - is that an homogeneously stimulated region corresponding to the figure is increasing an one side and decreasing on the other, which the contrary is happening to the other homogeneously stimulated region corresponding to the ground. Then, there are two homogeneously stimulated regions that are increasing on one side and decreasing on the other - they are both non moving. So there seems to be no motion at all on the retina. But there is

something, at the border between the two regions, - that is the abrupt abrpt jump of stimulation between one region and the other - which is wandering.

b) Now let us consider the encounter of the moving figure with another (still differently colored but homogeneous) figure, which is resting. We are interested in two different possibilities. Either (1) the moving figure is passing behind the resting figure, or (2) in front for it.

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FIGURE 11

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(1) At the moment of the encounter, the stimulation corresponding to the moving object decreases decreasing on one side and after a while increases on the other side, on the expense of the ground. But (2), as it passed in front of the figure, it is the resting figure which decreases on the same side, but this time at the profit of the stimulation corresponding to the moving figure, while after a time on the other side it is growing at the expese of the stimulation corresponding to the ground.

While in the first case (1) the moving figure was shrinking (because it was decreasing on one side while which remaining unchanged on the other side) till sometimes disappearing and then widening, in the second case (2), that is, when the figure was moving in front of the resting figure, it is the resting

figure that shrinks at the beginning, than sometimes disappears and then widens till regaining her prior size and form.

The moving, as well as the resting figure are both giving rise to the increasng and the decreasing of homogeneously stimulated regions, not to motion. But what about the borders? We see that there are borders between homogeneously stimulated regions that are resting and borders that are shifting. The borders of the retinal projection of the steady figure are steady while the borders of the moving figure are shifting.

5. Now let us go back to our illusion. What happens of the borders of the retinal projection of the apparently resting part of our configuration? They are decreasing on one side and decreasing on the other (as the borders of the retinal projection of the steady figure do, when it is covered or uncovered by the moving figure), but they are resting as the borders of the steady figure do.

So we are faced with two types of borders, the shifting borders of the retinal projection of the moving figure, which we shall call kinetically active borders and the resting borders of the projection of the steady figure as well as those of the projection of the apparently resting figure of the illusory configuration, which we shall call kinetically non-active borders.

But let us see what happens when a configuration (an object like our target) has some of the borders which are kinetically active, and some kinetically unactive, that is it has

kinetically unhomogeneous borders. What happens in this case is our illusory result: the configuration splits in two objects, each of them with kinetically homogeneous borders.

But this case is all but exceptional. Every time when a moving figure is passing in front or at the back of a resting figure, a similar situation arises at the retinal projection's level: an object moves in front or behind another object, giving rise to a configuration with kinetically inhomogeneous borders.

Through the tendency towards kinetically homogeneous borders a moving figure wandering in front or behind a resting one is seen.

So, when an object is moving in a field of resting objects, instead of a caleidoscopic change of widening and shrinking figures, through the tendency to kinetically homogeneous borders, the real thing is perceived.

THE DISAPPEARANCE OF A HOLE

The third example of a problem regarding an illusion, whose study appears to be interesting above the mere illusion, is the problem of the perception of a hole.

The illusion is simply demonstrated, without any apparatus.

We only need a cardboard with a hole in its central region, through which we see a part of an homogeneous region of different color. The hole, if the surface behind it is homogeneous, is not perceived as a hole, but as a figure, plasted on the cardboard, having as borders the borders of the hole. Varying every condition (form, size, color) we ~~see~~ saw that although there are conditions favoring or hindering the phenomenon, Dr Cavedon made a qualitative study of it - ~~it resulted that~~ the only necessary ~~one~~ condition to obtain the illusion appeared to the homogeneity of the surface visible through the hole. But we already learned the lesson that what really matters is not what happens on the target, but the stimulus conditions at the retinal level. Here we see that there is a difference between the stimulation provided by a piece of paper of different color attached on a screen and a hole in the screen only if the bottom of the hole is in homogeneous, but there is no difference if the hole is homogeneous, because in this case there is nothing that could give rise to retinal disparity, or to differential focussing, that is to depth perception. Again the problem seems to have disappeared.

Bur there is a problem unsloved in this case also: why do we see, in both cases, a paper attached on the surface and not a hole? The question seems to be solved by the onesided functioning of the border, the border being perceived as a part of the included and not of the including region of the field - a discovery due to Rubin and Koffka. But again, why is the

border functioning this way? And than, a strange exception. If the insides of the hole is black, (8) notwithstanding its perfect homogeneity, it is perceived as a hole.

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FIGURE 12

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So there are still several unanswered questions. The research in this field has been carried on by Proff. Da Pos and by Dr. Cavedon. Prof. Da Pos having observered a very interesting effect of apparent fog, and Dr. Cavedon having been able to obtain the opposite effect, putting on light some special conditions giving rise to the perception of a hole, when no real hole exists.

SUMMARY

The function of perceptual illusions in research is discussed and demonstrated analysing three perceptual illusions observed and studied by the Author and his collaborators: the apparent transparency, the apparent rest and the disappearing of a hole.

NOTES

1. In the target the parallel segments of the Muller-Lyer figure are equal, which in the perceptual configuration they are unequal.

2. K. Koffka, Principles of Gestalt Psychology, Cap.II.

3. The color can be varied without any effect on the phenomenon.

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6. This shift of attention success easier with display of Fig. 5 or 6.

7. We confine observer's task to take into consideration Fig. 5, for the sake of simplicily.

(8) It has to be a real black, with reflectance near to zero

8. Often this symple demonstration does not suceed because the surface behind the hole is not really homogeneous (if it is a wall, there are shadows on it). But Prof. Da Pos constructed a symple gadget, which makes coercive for every subject the disappearance of the hole.

Bibliography
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THE FUNCTION OF PERCEPTUAL ILLUSIONS IN RESEARCH (*)

Fabio Metelli

University of Padua (Italy), Department of Psychology

As the subject of this paper is perceptual illusions, it is perhaps useful to begin with a definition. According to Professor Rausch we speak of a perceptual illusion when the attributes of a perceived configuration differ from the corresponding characteristics of the target.

I give an example from the well known geometric optical illusions (Muller-Lyer, Fig.1) in order to clarify the meaning of the concepts of target and perceptual configuration. (1) But the demonstrations described and discussed in this paper will not concern the geometric-optical illusions.

The length of the horizontal segments is equal in the target and different in the perceptual configuration

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FIGURE 1
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At this point it this quite natural to ask the following questions. Why do the perceptual illusions have an important

place in Psychology? Are not illusions unimportant little problems?

Such a radical point of view was represented by James Gibson. We discussed this topic several times, the last time some months before he ~~passed away~~ died.

In my opinion there is a special reason ~~in~~ for stressing the importance of perceptual illusions. I shall begin by stating briefly my theoretical point of view. ~~However,~~ Then the main part of this paper will consist of demonstrating and discussing some phenomena which will serve to illustrate the theory.

At the beginning of experimental research in Psychology, but not only at the beginning, and often ~~also~~ nowadays too, the illusions were considered as exceptions, ~~where~~ in which our sensory apparatus did not function well, and therefore did not give, as it always does, true and trustworthy information about the real world. They were studied and are still studied as interesting special problems.

A point of view that has never been completely put aside is that the sensory apparatus cannot lie, and therefore a search has to be made for higher functions interfering with sensory data, ~~and~~ which are the origins of perceptual illusions.

It is however possible to consider perceptual illusions in a quite different way. According to this point of view they are considered alarm signals, breaks in the ~~cuirass~~ armor of our naive realism, through which the difference between perceptual and real becomes directly visible.

The very function of perceptual illusions is to force us to see a problem where before there seemed to be no problem at all.

It has always been very interesting for me to ascertain that not only the layman, the ordinary man, but also the specialist who founded all his research on the difference between perceptual and real, falls back, in his everyday life and behavior, ~~to~~ on naive realism in an absolutely natural way. What he sees is a car and not for a moment does he think that it is the perceptual image of a car.

It is necessary, in order to live a normal life, to ignore or at least to disregard the difference between the perceptual world and reality (behavioral and geographical environment, according to Koffka's original concepts). (2)

We have a typical way of defending ourselves and preserving our naive realism. If we stumble on a step we simply say that we did not see or did not notice it. And in the same way we often explain the tragic happening of a car accident: we did not see the person. It is clear that, according to the previous distinction between behavioral (or perceptual) and geographical (or real) environment, the step, or the person did not exist in our perceptual world. But with our explanation we mean that we should have been able to see the object under discussion, if we had only changed the direction of our ~~look~~ regard, or if we had changed the concentration of our attention. What we mean is that the perceptual apparatus was functioning correctly but we

did not use it in the right way. But there are cases, and these are just the perceptual illusions, where this explanation does not hold. In these cases, direction of ~~look~~ regard and attention do not help to perceive what is "really" there.

Let us take as an example the famous Ganzfeld experiment discovered by Wertheimer and studied by Metzger. There is a wall in front of us, and we see just fog. In this case there is no way to escape the problem, to make the phenomenon disappear. Change in attention or in directi~~ng the look~~ or of regard does not change what we are see~~ing~~. This type of phenomena generates a crisis ~~in~~ for our naive realism.

We have to explain why we do not see the wall, although it is ~~a~~ in front of us. Our first attitude in these cases is to look for a solution of the illusion as a special limited phenomenon. What we ask is: why did not the peripheral apparatus ~~regularly~~ correctly function in this special case although as a rule it gives us a true reproduction of reality?

Let us go back to the Ganzfeld-Phenomenon. The first, and more natural question is: Why don't we see the wall? But suddenly -- after a short or longer delay -- we discover that this is only a part~~ial~~ of the problem. Then we ask ourselves not only under which conditions we see fog instead of a wall, but also under which conditions we see a wall, when a wall is really in front of us. Why do we see, in this case, the color condensed on a surface in front of us, and before it a colorless transparent space? And why does the problem concern only the

wall? Under which condition do we see a chair, a desk, a book when these objects are in front of us?

In this sense the perceptual illusions are precious signals forcing us or aiding us to acknowledge a problem where there seemed to be no problem and everything appeared to be obvious. In this sense the perceptual illusions played an important part in the birth of ~~the~~ modern Perception psychology and convinced us Perception psychologists (I think at least the majority of us) that the perceptual world -- the only world with which we have direct contact -- is all a set of problems, which have to be discovered -- and this is often the most serious difficulty -- before trying to solve them.

With this assertion I ~~am~~ end~~ing~~ the first part of my paper. Now I ~~'ll~~ shall try to show-- using as examples some perceptual illusions which have been observed and studied by my collaborators and ~~I~~ me -- the development of the problems according to what I said before, that is, to show how a wider insight develops from a limited special problem.

APPARENT TRANSPARENCY

My first example of a perceptual illusion is apparent transparency. Of course, ~~studying~~ the study of the perception of transparency ~~we have to answer~~ raises a natural objection. Transparency is not a perceptual but a physical problem, we perceive transparency when a physical object is permeable to the light. Therefore we have to begin by showing that physical transparency is neither a necessary nor a sufficient condition for perceiving transparency.

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FIGURE 2
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The display represented in Fig. 2 is generally perceived as transparent. But there is nothing physically transparent there. It is just a mosaic number? of opaque pieces of cardboard of different color. So, physical transparency is not a necessary condition for perceiving transparency, or in other words, there are cases of apparent transparency. On the contrary, nobody perceives transparency in the display of Fig. 3, while the red plastic which is glued upon a white cardboard is physically transparent.(3) And this proves that physical transparency is not a sufficient condition ~~to~~ of perceived transparency.

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FIGURE 3
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~~But thinking of~~ As to the stimulation ~~originating~~ responsible for? the perception of transparency, it is clear that the visual system does not receive any information about the conditions giving rise to transparency, namely ~~if~~ whether the light rays stimulating the retina passed or not through a transparent medium.

How do we study perceptual transparency? As every other perceptual phenomenon, by changing the conditions systematically, especially the colors and the forms of the surfaces giving rise to it. In this way, we have been able to formulate mathematically some conditions of the perception of transparency. (Metzli 1970, 1985)

But here I have to confine myself to a little demonstration, which is in a way typical as it shows an important aspect of the phenomenon. Putting the two displays 3 and 3a together in such a way that there is continuity between the borders of the plastics (Fig. 4), transparency is perceived. We are forced to draw the conclusion that transparency depends on a complex stimulation of the visual organ. It is what we call a gestalt phenomenon, or in other words it does not depend on local stimulation, which in our example did not change.

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FIGURE 3a
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FIGURE 4
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But the conclusion of our demonstration is that the conditions of perceptual transparency, although studied first with ~~starting from~~ cases of apparent transparency, are valid also in the more common case, when physical and perceptual transparency coincide. The problem has widened, it is no more the problem of the conditions of apparent transparency, but the general problem of the perception of transparency without restriction.

APPARENT REST

A much more striking example in which ~~where~~ a wider insight develops from a special problem, is the perceptual effect I call apparent rest. If the display reproduced in Fig. 5 is rotated slowly around the center of the semicircle, (4) what we see is a complete resting disk with a series of circles inside, which is periodically covered and uncovered by a rectangle turning on it. If the display of Fig. 6 is rotated slowly around the center of the inside arc, we see a resting circle periodically covered and uncovered by a peripherically located circle rotating on it.

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FIGURE 5
==========

The phenomenon was observed by Wittmann (1920) and by Werner and Wildhagen (1929) ~~on~~ when fusing two colors with the Maxwell disk (Fig. 7). When the current is interrupted, the rotating disk slows down ~~till resting.~~ until it comes to rest? When the speed is slow, one sees one sector (the ~~minor~~ smaller one) rotating upon a steady disk.

==========
FIGURE 6
==========

Strangely enough, the above authors did not change the form of the display systematically, but stuck to the Maxwell disk. Wittman (5) tried to give an explanation of the phenomenon, asserting that when the subject concentrates on the motion of the ~~minor~~ smaller sector, the ~~major~~ larger one closes in a circle. An explanation which is evidently wrong, because the more a subject concentrates ~~its~~ his attention on the apparently resting circle, the greater the evidence of the phenomenon (6) of apparent rest.

==========
FIGURE 7
==========

1. Changing systematically the shape of the display, I

discovered immediately that the Maxwell disk was the worst display for demonstrating the phenomenon and that the only necessary condition was that at least one part of the contour corresponds to the trajectory of a point. It is therefore perhaps opportune to stress that the phenomenon is not limited to the rotatory motion but can be obtained with translatory motion as well.

A typical example of apparent rest with translatory motion is obtained with the apparatus sketched in Fig. 8, while the ~~reverse of the~~ phenomenon connected with induced motion is what we observe travelling ~~with~~ on a train when we see the telegraph poles moving, while the wires are rest~~ing~~at.

induced motion

2. But the problem can be seen from another angle, that is from the point of view of the retinal stimulation.

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FIGURE 8
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Then the new question is: ~~which~~ what modifications ~~on~~ of the proximal stimulation are caused by the motion of the target? Let us try to give a very rough description of it.

It is easy to see that when the target, made of two differently colored regions, rotates, the region stimulated by stimulus a decreases on one side and increases on the other; and the contrary happens to the region stimulated by the b stimulus. The result is that we are perceiving the b region

moving over a steady complete circle.

==========
FIGURE 9
==========

But what happens at the proximal stimulation level if we imitate with the target what we were perceiving, that is if we use as a target a steady circle upon which a rectangle is turning? (7) Then we see, to our surprise, that what happens on the retinal projection is exactly the same: the a region is increasing on one side and decreasing on the other, and the contrary happens to the b region. Therefore, as the stimulation is the same in both cases, the perception is ~~necessarily~~ the same.

The explanation is very simple and there is no longer a problem. Our problem seems to have disappeared.

3. However, a more thorough analysis shows that not everything has been explained. Because, while it is clear that, when the stimulation is the same, the perception has to be the same, it is by no means clear why we perceive in both cases a figure rotating and a resting one, and not the whole configuration rotating. In other words, why do we see in both cases a rectangle turning on a resting complete circle and not a half circle rotating together with a rectangle?

It is interesting to point out that the problem has widened: it ~~doesnt any~~ no longer regards the illusion only, but the

non-illusory situation as well.

4. Then we are faced with a more general problem: what happens on the retina when an object is moving upon a background?

a) to study a typical example, let us simplify the case considering a~~n~~ homogeneously colored figure moving in front of a different homogeneously-colored background (Fig. 10).

==========
FIGURE 10
==========

The result -- ~~on~~ in the proximal stimulation -- is that a~~n~~ homogeneously stimulated region corresponding to the figure is increasing on one side and decreasing on the other, while the contrary is happening to the other homogeneously stimulated region corresponding to the background. Then, there are two homogeneously stimulated regions that are increasing on one side and decreasing on the other -- they are ~~both~~ at a stand-still. So there ~~seems to be~~ is no motion at all on the retina. But there is something -- the border between the two regions, -- that is the abrupt jump of stimulation between one region and the other, which is ~~wandering~~ moving. (Figure 11)

b) Now let us consider the encounter of the moving figure with another (still differently colored but homogeneous) figure, which is ~~resting~~ at rest. We are interested in two different possibilities. Either (1) the moving figure is passing behind

Fig?

the resting figure, (Figure 11) or (2) ~~in~~ passing in front of it.

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FIGURE 11
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(1) At the moment of the encounter, the stimulation corresponding to the moving object decreases on one side and immediately, or after a while, increases on the other side, at the expense of the background. But (2) as it passes in front of the figure it is the resting figure which decreases on the same side, but this time to the advantage of the stimulation corresponding to the moving figure, while immediately, or after a time, on the other side it is growing at the expense of the stimulation corresponding to the ground.

While in the first case (1) the moving figure was shrinking (because it was decreasing on one side while remaining unchanged on the other side) ~~till sometimes disappearing~~ until it disappeared? and then widen~~ing~~ed, in the second case (2), that is, when the figure was moving in front of the resting figure, it is this figure that shrinks at the beginning, then sometimes disappears and then widens ~~till~~ until regaining its prior size and form.

The moving as well as the resting figure both give rise to the increasing and the decreasing of homogeneously stimulated regions, not to motion. But what about the borders? We see that there are borders between homogeneously stimulated regions that are resting and borders that are shifting. The borders of the

retinal projection of the steady figure are steady while the borders of the moving figure are shifting.

5. Now let us go back to our illusion. What happens to the borders of the retinal projection of the apparently resting part of our configuration? They are increasing on one side and decreasing on the other (as do the borders of the retinal projection of the steady figure, when covered or uncovered by the moving figure), but they are resting as the borders of the steady figure do.

So we are faced with two types of borders, the shifting borders of the retinal projection of the moving figure, which we shall call kinetically active borders and the resting borders of the projection of the steady figure (as well as those of the projection of the apparently resting figure of the illusory configuration) which we shall call kinetically non-active borders.

But let us see what happens when a configuration (an object like our target) has some borders which are kinetically active, and some kinetically inactive, that is it has kinetically inhomogeneous borders. What happens in this case is our illusory result: the configuration splits in two objects, each of them with kinetically homogeneous borders.

But this case is all but exceptional. Every time a moving figure is passing in front or behind a resting figure, a similar situation can arise at the level of the retinal projection, giving rise to a configuration with kinetically inhomogeneous

borders: through a tendency towards kinetically homogeneous borders a moving figure wandering in front or behind a resting one is seen.

So, when an object is moving in a field of resting objects, instead of a ~~c~~Kaleidoscopic change of widening and shrinking figures, through the tendency to kinetically homogeneous borders, ~~the real thing is perceived.~~ object The perceptised configuration ~~[illegible]~~ answers the characteristics corresponding to the target.

THE DISAPPEARANCE OF A HOLE

The third example of a problem regarding an illusion, the study of which appears to be interesting ~~part~~ apart from the mere illusion, is the problem of the perception of a hole.

The illusion is simply demonstrated, without any apparatus. We only need a cardboard with a hole in its central region, through which we see a part of a homogeneous region of a different color. (Fig 12 The hole, if the surface behind it is homogeneous, is not perceived as a hole, but as a figure, pasted on the cardboard, having as borders the borders of the hole. Varying every condition (form, size, color) we see that although there are conditions favoring or hindering the phenomenon -- Dr. Cavedon made a qualitative study of it -- it ~~resulted~~ appears that the only necessary condition to obtain the

illusion ~~appeared to be~~ is the homogeneity (8) of the surface visible through the hole.

But we know that what really matters is not what happens on the target, but the stimulus conditions at the retinal level. Here we see that there is a difference between the stimulation provided by a piece of paper of a different color attached to a screen and a hole in the screen, only if the bottom of the hole background? is not homogeneous, but there is no difference if the hole is homogeneous, because in this case here is nothing that could give rise to retinal disparity, or to differential focussing, that is, to depth perception. Again the problem seems to have disappeared.

But there is an unsolved problem in this case also: why do we see, in both cases, a paper attached ~~on~~ to the surface and not a hole? The question seems to be solved by the one-sided functioning of the border, the border being perceived as a part of the included and not of the including region of the field -- a discovery made by Rubin and Koffka. But again, why does the border function~~ing~~ in this way? And then, a strange exception. If the inside of the hole is deep black, notwithstanding its perfect homogeneity, it is perceived as a hole.

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FIGURE 12
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So there are still several unanswered questions. The

research in this field has been carried out by Prof. Da Pos and by Dr. Cavedon, Prof. Da Pos having observered a very interesting effect of apparent fog, and Dr. Cavedon having been able to obtain the opposite effect, showing up some special conditions giving rise to the perception of a hole, when no real hole exists. in the target. appearances

SUMMARY

The function of perceptual illusions in research is discussed and demonstrated by analysing three perceptual illusions observed and studied by the Author: ~~the~~ apparent transparency, ~~the~~ apparent rest and the disappear~~ing~~ance of a hole.

NOTES

* I spoke on this topic several times, mainly abroad (USA, India, Austria), but always with demontrations, arousing some interest. Some colleague friends expressed the opinion that I should publish my talk. I have accepted their encouragement

although such a paper had the ~~big~~ considerable handicap of its lack of demontrations, which were, I think, the most appealing part of my talk.

1. In the target the ~~parallel~~ horizontal segments of the Muller-Lyer figure are equal, while in the perceptual configuration they are unequal.

2. K. Koffka, Principles of Gestalt Psychology, Cap.II. chap. 2.

3. The color can be varied without any effect on the phenomenon.

4. If the display is reproduced in normal size (radius about 15 cm) the effect can be observed at home, using ~~a~~ the turn table ~~for records.~~ of a record player.

5. I was not able to retrace find out either by asking Professor Werner himself or at Hamburg University, W. and W.'s paper. what do you mean?

6. This shift of attention occurs ~~easier~~ more easily with display of Fig. 5 or 6.

7. We confine~~d~~ ourselves to ~~take into consideration~~ Fig. 5, for the sake of simplicity.

8. Often this s~~y~~imple demonstration does not succeed because the surface behind the hole is not really homogeneous (e.g., if it is a wall, there are shadows on it). But Prof. Da Pos constructed a simple ~~gadget~~ apparatus, with constant illumination, which makes the disappearance of the hole coercive for every subject.

Die Funktion der Wahrnehmungstäuschungen für die Forschung

The subject of this Seminar are perceptual illusions

Mein Vortrag betrifft die Wahrnehmungstäuschungen. Es

It is perhaps useful to begin with a definition

ist deshalb vielleicht angemessen mit einer Definition anzufangen.

According to a famous specialist on the subject, professor Erwin Rausch

Nach einem berühmsten Spezialisten dises Gebietes, Professor

of the Univ. of Frankfurt in Germany, it is the case to speak of perceptual

Edwin Rausch ist es von Täuschung zu sprechen sofern die

illusions when the ~~relations~~ characteristics of the ~~perceptual~~ perceived configuration

Verhältnisse (die metrischen Verhältnisse im Falle der Geometrik-

differ from the corresponding characteristics [of the configuration] of the Target

optischen Täuschungen) der wahrhenommenen Configuration sich

I give an example FROM THE WELL KNOWN GEOM-OPTICAL ILLUSIONS

von den zugehörigen Verhältnissen der Vorlagekonfiguration

But I intend TO SPEAK OF PERCEPTUAL ILLUSIONS IN A WIDER

unterscheiden.* Hier werde ich ~~habe~~ nicht von geometrisch-optischen

MEANING

Täuschungen sprechen, sondern von Wahrnehmungstäuschungen im

weiteren Sinne.

AT THIS POINT IT IS QITE NATURAL TO ASK THE

Da wir nun das Gegenstandsgebiet festgestellt haben,

FOLLOWING QUESTION. WHY HAVE THE PERCEPTUAL ILLUSIONS

kommt fast von sich selbst eine natürliche Frage. Warum haben

AN IMPORTANT PLACE IN ALMOST EVERY HADBOOK OF PSYCHOLOGY?

die Wahrnemungstäuschungen einen besonderen Platz in jedem

ARE NOT THE ILLUSIONS UNIMPORTANT LITTLE PROBLEMS

Handbuch der Psychologie? Sind sie wirklich so bedeutend, oder

WHICH ONLY A PEDANT CAN CHOOSE AS OBJECT OF

handelt es sich schliesslich um unwichtige kleine Probleme die

a RESEARCH?

nur ein Pedant zum Objekt einer besonderen Forschung wählen

sollte?

SUCH A RADICAL POINT OF VIEW WAS REPRESENTED

Ein so radikaler Standpunkt wurde von einem grossen Psy-

BY THE FAMOUS AMERICAN PSYCHOLOGIST JAMES GIBSON

chologen, unserem lieben verstorbenen Freund James Gibson vertreten.

* Beispiel; ~~von die Konzepte von~~

A DEAR FRIEND OF MINE WHO DIED A YEAR AGO.
Ich war einer anderen Meinung und habe öfters mit ihm, freudlich
WE DISCUSSED SEVERAL TIMES THIS TOPIC.
aber lebhaft diskutiert. Das letzte Mal, wenige Monate vor seinem Verschieden.

AT MY OPINION THERE IS A SPECIAL REASON
Ich glaube dass ein besonderer Grund besteht um die
TO STRESS THE IMPORTANCE OF PERCEPTUAL ILLUSIONS
Wichtigkeit der Wahrnehmungstäuschungen zu betonen.
I'LL BEGIN WITH STATING BRIEFLY MY THEORETICAL STANDPOINT
Am Anfang hat man die Täuschungen nur deshalb studiert,
AT THE BEGINNING ILLUSIONS HAVE BEEN CONSIDERED *
weil sie Ausnahmen bildeten, in denen unsere Sinnesapparate
AS EXCEPTIONS, WHERE OUR SENSORY APPARATUS DID NOT
nicht richtig funktionierten, so dass sie uns nicht, wie immer,
FUNCTION WELL, AND THEREFORE DID NOT GIVE US, AS THEY
richtige Auskünfte über die Wirklichkeit gaben. Man studierte
ALWAYS DO, TRUE AND TRUSWORTH INFORMATION ABOUT
die Täuschungen eben als Täuschungen, an und für sich, als
THE REAL WORLD. THEY WERE STUDIED, AND ARE STILL
kleine, interessante Probleme. Am Anfang war man sogar überzeugt,
STUDIED AS LITTLE INTERESTING PROBLEMS.
dass ~~uns~~ die Sinnesapparate ~~nie~~ täuschten. Man suchte deshalb
welche höhere Funktionen (Urteile, Gedächtnissbilder) mit den
Gegebenheiten der Sinnesapparate interferierten und die Ursachen
des falschen Wahrnehmungsbildes waren.

[Üblicher Weise hat man die Täuschungen als Ausnahmen
betrachtet, in denen unsere Sinnesapparate oder unsere Wahrnehmungs
prozesse nicht richtig funktionieren, so dass sie uns nicht,
wie sonst immer, richtige Auskünfte über die Wirklichkeit
geben.]

* THE MAIN PART OF THIS SEMINAR WILL CONSIST IN DEMONSTRATING AND DISCUSSING ~~some~~ PERCEPTUAL ~~D~~ ILLUSIONS WHICH WILL SERVE TO ILLUSTRATE THE THEORY.

IT IS HOWEVER POSSIBLE TO CONSIDER THE PERCEPTUAL

Problem der Wahrnehmungstäuschungen in einer ganz anderen Weise

ILLUSIONS IN A ~~QUI~~ QUITE DIFFERENT WAY. ACCORDING TO

betrachten. Nach diesem Standpunkt sind die W.T. eine Art

THIS POINT OF VIEW THEY ARE CONSIDERED ALARM

Alarmsignale, Zeichen von Maschenauslösungen, Brüche in der

SIGNALS, BREAKS IN THE CUIRASS OF OUR NAIVE REALISM.

Panzer unseres naiven Realismus, durch die man die Verschiedenheit

THROUGH WHICH THROUGH WHICH THE DIFFERENCE BET-

von Phänomenalen und Realen direkt begreift. Und die Funktion

WEEN PERCEPTUAL AN REAL BECOMES DIRECTLY VISIBLE.

der Wahrnemungstäuschungen ist, uns zu zwingen, ein Problem zu

THE VERY FUNCTION OF PERCEPTUAL ILLUSIONS IS TO FORCE US TO

SEE A PROBLEM WHERE BEFORE THERE SEEMED TO BE NO PROBLEM.

sehen, ~~dass~~ wo früher kein Problem zu bestehen schien.

IT HAS BEEN ALWAYS VERY INTERESTING FOR ME TO

Es ist für mich immer interessant gewesen, zu bemerken

ASCERTAIN THAT NOT ONLY THE LAYMEN, THE ORDINARY

dass nicht nur die Laien, sondern auch die Sachverständige, ~~die~~

MEN BUT ALSO THE SPECIALISTS, WHO ARE CONVINCED OF THE DIFFE-

~~genigen~~ die der Verschiedenheit des phänomenalen von realen

RENCE BETWEEN PERCEPTUAL AN REAL, ~~FARE~~ GO UP, IN THEIR

(Milieu) überzeugt sind, im gewöhnlichen Leben und Verhalten

COMMON LIFE AND BEHAVIOR, TO NAIVE REALISM IN ~~THE~~ A PERFECTLY

das Denken des naiven Realisten natürlischer Weise übernehmen.

NATURAL WAY: WHAT I SEE IS A CAR AND NOT MY PERCEP-

TION OF A CAR.

um normaler Weise zu leben

Es ist scheinbar notwendig für uns die Unterscheidung zwischen

IT IS APPARENTLY NECESSARY, IN ORDER TO LIVE A NORMAL LIFE,

TO IGNORE OR AT LEAST TO DISREGARD THE DIFFERENCE BETWEEN

Wahrnehmungswelt und Realität (Koffka's behavioral und geographical

~~TH~~ PERCEPTUAL WORLD AND REALITY (BEHAVIORAL AND GEOGRAPHI-

Environment) zu ignorieren oder weigstens zu vernachlassigen. Wir

CAL ENVIRONMENT ACCORDING TO KOFFKA)

haben eine typische Weise, uns zu verteidigen, und das Realismus

ansprecht zu erhalten.

Wenn wir auf einer Stufe stolpern, sagen wir ganz einfach

dass wir die Stufe nicht gesehen oder nicht bemerkt haben. Und

dasselbe sagen wir im tragischen Fall, dass wir mit dem Auto

Nach der vorher geschilderten Unterscheidung zwischen W.W. u. Realität

einen Radfahrer überfahren. ~~Das~~ bedeutet nur ganz einfach dass die

Stufe, oder der Radfahrer in unserer Wahrnehmungswelt nicht

existierte. Wir meinen aber, dass wir den betreffenden Gegenstand

hätten sehen können, wenn wir nur unsere Blickrichtung geändert

oder unsere Aufmerksamkeit konzentriert hätten. Was wir in diesen

Fällen meinen ist das das Apparat richtig funktionnierte, und

wir es nicht richtig gebraucht haben.

Es gibt aber Fälle, gerade die Wahrnehmungstäuschungen, wo Blickrichtung und Aufmerksamkeit nicht helfen, um was wirklich dabei ist, wahrzunehmen. Wann wir an das Wertheimer-Metzger'sche Ganzfeldphänomen denken, da gibt es kein Ausweg, keine Weg-erkärung. Vor uns steht eine Wand, un wir sehen Nebel; und das Phänomen besteht, so viel wir auch unsere Aufmerksamkeit konzentrieren. Dann gerät das naive Realismus in eine Krise. Man muss erklären warum, obwohl die Wand vor uns steht, wir sie nicht sehen.

Zuerst ist man geneigt die Lösung der Täuschung als spezielles, begrenzted Phänomen an erforschen. Die Frage lautet: warum hat in jenem besonderen Fall das Wahrehmungsapparat, das in der Regel eine treue Reproduktion der Realität wiedergibt, nicht regelmässig funktioniert?

Dieser Weg für jede W.T. gefolgt

So wird für jede Wahrnehmungstäuschung eine verschiedene Lösung gefunden. Es ist wie eine Maber wo ein Stück vom Mörtelüberzug gefallen ist. Man reparierd es, so dass die Farbe homogen ist und kein Fehler mehr, wenigstens für den oberflachlichen Beobacher, zu sehen ist. Das selbe kann ein zweites, ein drittes Mal und noch öfters vorkommen. Aber früher

oder später fällt der ganze Mortelüberzug hinunter und ~~mit~~ grossen Überraschung und Freude entdeckt man, das unter dem Überzug ein Fresko verborgen war.

So was geschieht, früher oder später, wenn man eine Wahrnehmungstäuschung untersucht. Kehren wir zur Ganzfeld erscheinung zurück. Zuerst fragt man sich warum man im diesem Falle die Wand nicht sieht. Aber auf einmal leuchtet es ein dass das ~~nicht~~ ein Teilproblem ist erweitert sich das Problem. Man fragt sich nicht nur unter welchen Bedingungen man Nebel, statt einer Wand, wahrnehmt, sondern auch unter welchen Bedingungen man eine Wand sieht wenn eine Wand sich wirklich vor uns befindet. Wieso sieht man in diesem Fall die Farbe an einer Oberfläche kondensiert, und vor dieser Oberfläche den farblosen durchsichtigen Raum? ? Und warum soll das Problem nur die Wand betreffen? ~~Warum~~ Unter welchen Bedingungen sehen wir eine Sessel, ein Pult, ein Buch wenn diese Gegenstände vor uns liegen?

In diesem Sinne sind sie Wahrnehmungstäuschungen kostbare Anzeichen, die uns helfen oder sogar zwingen ein Problem zu erkennen wo gewönlich kein Problem zu bestehen scheint und alles sich als natürlich bietet. In diesem Sinne haben die Wahrnemungstäuschungen zur

Corrio

Geburt der Wahrnehmungspsychologie beigetragen, und haben uns Wahrnehmungspsychologen überseugt (ich glaube wenigstens die meisten von uns) dass die Wahrnehmungswelt - die einzige Welt mit der wir in direktem Kontakt sind - all eine Gesemtheit von Problemen, ist, die entdeckt werden müssen (und das ist eine ernste, nicht übersehebare Schwierigkeit) bevor man sie zu lösen anfängt.

Mit diesem ~~Abschluss~~ Behauptung ist der theoretische Teil meines Vortrags zu Ende. Nun möchte ich versuchen aus einigen Untersuchungen über Wahrnehmungstäuschungen - die von meiner Forschungsgruppe stammen ~~worden~~ - die Entwicklung jedes Problems nach dem vorher gesagten folgen , nämlich zeigen wie aus einem beschränkten, speziellen Problem sich eine allgemeinere Problematik entwickelt.

Das erste Beispiel betrifft die Durchsichtigkeitswahrnehmung, ein Gegenstand dem ich mich sehr lange gewidmet habe.

7

Wenn ich sage, dass meine experimentelle Forschung die Durchsichtigkeitphänomene betrifft, hat man mir oft erstaunt eingewändet: Wieso kann ein Psychologe die Durchsichtigkeit erforschen? ~~Die Durchsichtigkeit~~ ist ja ein physikalisches Phänomen. Ein Ding oder ein Medium ist durchsichtig wenn es die Lichtstrahlen durchkommen lässt; es kann sämtliche Strahlen durchgehen lassen, oder einen Teil einsaugen aufzehren, oder nur gewisse Wellenlängen durchlassen. Was ich nicht einsehen kann, ist wo man, in diesem Gebiet, ein Wahrnehmungs Problem vorfindet, das sich von den üblichen Problemen der Gesichs Wahrnemnung unterscheidet.

Ich denke, dass mehere meiner Zuhorer diesen Standpunkt teilen. Ich glaube, dass eine sehr einfache Demonstration der beste Weg ist, sie zu überzengen dass die Durchsichtigkeit ein echtes Wahrnehmungsproblem ist ~~ist das beste is, sie zu überzeugen.~~

— Vorlegen —

Sieht jemand etwas durchsichtiges hier? und hier? — Vorlegen — Und doch ist die rote Schicht eine physikalisch durchsichtige Plastik, während hier nur ein Mosaik undurchsichtiger verscieder farbiger Pappenstücke ist.

Man ist also berechtigt davon zu schliessen dass die physikalische Durchsichtigkeit weder eine ausreichende noch eine notwendige Bedingung der Durchsichtigkeits Wahrnehmung ist.

Hier hat sich gezeigt dass eine Täuschung ein Mittel sein kann

zu beweisen dass das naive Realismus falsche Schlüsse erzwingen ~~kann~~, und Wahrnehmensprobleme tarnen kann. — Vorlagen —

Ich will noch einen Schritt machen. Hier sieht man ~~Ich will noch~~ eine undurchsichtige, rölliche Figur (das wissen hat ja im Allgemeinen keinen Einfluss auf die Wahrnehmung), und hier auch. Wenn man aber die zwei Vorlagen zusammen stellt, werden auf einmal die resultierende ~~un~~einheitliche Figur durchsichtig.

Was können wir daraus schliessen? Dass die D.W. von der Durchsichtigkeitswahrnehmung Wirkung einer Komplexeen Reizung auf unsere Netzhaut abhängt. Man ist berechtigh (meiner Meinung nach) von einem Feld- oder Gestaltphänomen zu sprechen.

Die Täuschung ist in diesem Fall auch ein Mittel, das Phänomen zu erforschen. Man braucht nur, wie meine Mitarbeiter und ich gemacht haben, die Form und die Farben der Vorlage systhematisch zu ändern, um die notwengigen Bedingungen der D.W. zu entdecken.

Wir sind aber vielleicht von unsern ~~xxxxxx~~ ursprünglichen Thema entgleisst. Ich wollte Ihnen, mit diesem Beispiel zeigen, dass die Analyse einer Täuschung ~~von~~ zu einer Umkehrung des Gesichtspunktes führen kann, so dass nicht die Täuschung, sondern das ganze Gebiet, ~~auch und~~, und besonders, die Wirklichkeitstreuen Wahrnehmungen zum Problem werden.

Revedere

Zu diesem Zweck geht man am besten von dem begrenzten Problem der Täuschung (in diesem Falle der Durchsichtigkeitstäuschung) aus. Warum täuscht uns diese Figur? Man kann von der üblichen Hypothese ausgehen, dass es ein Erfahrungseffekt ist. Wir ~~haben~~ wollen aber nicht diesen Aussichtslosen Weg folgen. ~~Vielleicht~~ Wieder gesagt beginnt man ~~kann man experimentieren~~, die Form und die Farben systhematisch zu ändern, um die notwendigen Bedingungen der Täuschung zu entdecken. Auf einmal aber wird es dem Forscher klar, dass die notwendigen Bedingungen nicht nur für die Täuschung, für den Fall der scheinbaren Durchsichtigkeit gelten, sondern auch für den Fall der physikalischen Durchsichtigkeit. Und dann studiert man die Durchsichtigkeits Wahrehmung abgesehen vom nebensachlichem Problem, ob es sich um die wirkliche oder die scheinbare Durchsichtigkeit handelt.

Ich will Ihnen ein anderes Wahrnehmungseffekt zeigen.

– Vorlage –

Wollen sie so höflich sein, ganz einfach zu beschreiben was Sie sehen?

Sehen auch die anderen Damen und Herren das selbe?

Es handelt sich auch hier um eine Wahrnehmungs Täuschung die ich Scheinruhe genannt habe.

Ich glaubte das Effekt entdeckt zu haben, aber ~~das Effekt~~ wurde vor mir von Werner beobachtet und vor Werner von Wittmann in Jahre 1920.

Beide Wissenschaftler beobachtiten das Phänomen an der Maxwellschen Scheibe. Als die Scheibe noch nicht schnell dreht, so dass man noch nicht die Vorstufen der Schmelzung beobachtet, oder wenn sie langsam dreht weil man den Strom ausgeschaltet hat, ~~xxxxxxxxx~~ sieht man ein Sektor auf einer ruhenander einfärbiger Scheibe drehen.

Aber, während sowohl Wittmann wie Werner an den Bedingungen der Maxwellschen Scheibe stecken geblieben sind, habe ich alle alle Veranderlichen (Form, Farbe, u.s.w.) und bis zum Schluss gekommen, dass die einzige notwendige Bedingung des Phänomens war dass mindestens ein Teil der Kontur der Bahn den Bewegung entspräche. Bisher scheint es sich nur un die Erforschung eines Kursiosum zu handeln. Tatsachlich habe ich mich zuerst- es war einer der ersten Veröffentlichungen beschränkt das Problem

in dieser begrenzten Weise zu erforschen. Ich hatte aber den Eindruck dass mir das Wesen des Problems entgangen war.

In diesem Fall kann man, in der historischen Entwicklung der Forschung, drei verschiedene Stufen Unterscheiden. Die ~~erxe~~ erste, bisher beschriebene Stufe, ist die Begrenzte Erforschung der Täuschung, um deren notwendige Bedingungen zu ermitteln.

Nach vielen Jahren (15) dünkte es mir, dass eine Betrachtung des Effektes am ~~Xxxxxx~~ Niveau der proximalen Reizung, neue Einsicht (neues Licht) dem Problem bringen könnte.

Welche Änderingen in der proximaler Reizung werden von den verschiedenen Änderungen an der Verlage verursacht? Das kann als die zweite Stufe der Forschung gelten. Und hier auf einmal die grosse Überraschung. Die Täuschende Vorlage, die Scheinruhe verursacht, und eine übereinstimmende Korrespondere~~d~~ Vorlage, die die echte Ruhe der Korresponderunden Teile der Vorlage verwirklicht verursachen die selbe Reizung. — Vorlage —

Die Täuschende Vorlage reproduziert die Reizung einer nicht tauschenden Vorlage. Die Täuschung stellt also kein Problem; unser Problem ist ganz einfach verschwunden.

Doch bleibt etwas zu erklären. Warum sehen wir - im Falle der Täuschenden sowie im Falle der nicht täuschenden Vorlage - einen Rechteck, der auf einem ruhenden Kreis rotiert, und nicht einen Halbkreis der zusammen mit dem Rechteck rotiert?

Hier beginnt die dritte Stufe: die euristische Funktion der Täuschung wird klar. Das Problem hat sich erweitet es betrifft nicht mehr nur die Täuschung, sondern auch die Fälle in denen keine Täuschung stattfindet, wo die Wahrnehmung uns eine treue Wiedergabe der Vorlage verschafft.

Ich glaube dass man ein Lösung finden kann, wenn man (das Problem erweitert und) sich fragt was auf der Netzhaut stattfindet wenn sich ein Gegenstand vor einem Grund bewegt.

Denken wir an den vereinfachten Fall der Bewegung einer farbhomogenen Figur auf einem andersfärbigen homogenen Grund. Auf der Netzhaut haben wir eine homogen gereizte Fläche, die von einer Seite wächst und von der anderen schrumpft. Im Falle unseres Beispiels geschieht das für den Halbkreis sowie für den Rechteck. ~~Aber für die Kontur - die Rechteck.~~ Aber für betreffend der Kontur - die Region wo sich die Reizung sprunghaft verändert - geschieht etwas verschiedenes für den Rechteck und für den Halbkreis.

In dieser Beziehung ist es erforderlich, zwischen zwei verschiedenen Arten Ränder zu unterscheiden. Es gibt Ränder die der Bahn eines Punktes antsprechen. Wenn eine farbhomogene Figur nur Ränder dieser Art hat (z.B. ein rotierender Kreis), bewirkt die Bewegung keine Reizänderung an der Netzhaut. In diesem Fall wird die Figur, obwohl sie sich bewegt, als ruhend Wahrgenommen. Deshalb werden wir diese Art Ränder, "Kinetisch unwirksam" nennen. Alle andere Ränder, die durch die Bewegung eine Reizanderung an der Retina verursachen, nennen wir kinetisch wirksam. Es leuchtet aber gleich ein, dass in diesem Fall, da am Niveau der Netzhaut keine Änderung statt findet, man zwischen einem bewegten und einem ruhenden Gegenstand nicht unterscheiden kann. Was geschieht aber im Falle unserer Vorlage, die nur Teilweise Kinetisch unwirksame Ränder hat? Hier verhalten sich die Ränder am Niveau der Netzhaut wieder in verschiedener Weise: die Kinetisch wirksamen Rander verlagern sich, während die Kinetisch unwirksamen Ränder wachsen von einer Seite und Schrumpfen von der anderen. Die selbe Beschreibung gilt aber auch, wenn di Vorlage aus einem Rechteck besteht der sich auf einer

ruhenden scheibe bewegt. So kann man als kinetisch unwirksam alle Ränder betrachten die entweder keine Änderung am Niveau der Netzhaut bewirken, oder wachsen von einer Seite und schrumpfen von einer anderen. Und das gilt wieder auch für alle ruhenden Gegenstände, deren Ränder deshalb der Klasse der Kinetisch unwirksamen gehören.

Wie können wir, von dem Charakter der Grenzen ausgehend das Abbrechen unserer Vorlage in einem ruhenden Kreis und einem rotierenden Rechteck beschreiben? Ganz einfach: Durch die Bewegung entstehen zwei Gebilde, dessen jedes Kinetisch homogene Ränder besitzt. Man kann durch naheliegende Experimente feststellen, welche Resultate man unter verschiedenen Bedingungen erhält.

Aber hier interessiert uns das erweiterte Problem. Wir haben eine Tendenz zur Kinetischen Homogenität der Ränder festgestellt. Was geschieht wenn sich ein Gegenstand bewegt in einem Felde das von verschiedenen unregelmässingen und auf einander gelegten Dingen besetzt ist? Auch in diesem Fall können wir zwischen Ränder die entweder keine Änderung an Niveau der Netzhaut bewirken, oder sich ausdehnem und schrumpfen, und andere, die Kinetisch

Wirksamen, die sich verlagern. Es ist seit langem bekannt dass die physikalische Bewegung nicht als Reiz für die Bewegungswahrnehmung wirken kann. Deshalb betrachten wir was am Niveau der Netzhaut verkommt. Die Bewegung des Gegenstandes bewirkt ein Wachsen und Schrumpfen mehrerer verschieden gereizter Flächen (am Sinnesorgan) ~~bleiben ständig~~ Die Grenzen zwischen den verschieden gereizten Flächen bleiben ständig oder wachsen und schrumpfen (auch die Konturen der ruhenden Dingen, die von dem bewegten Ding zeitlich gedeckt werden, wachsen und schrumpfen). Aber die Konturen des bewegten Dinges sind die einzigen die sich (ausgenommen der sehr seltenen Fall der Korrespondenz eines Teiles mit der Traiektorie des Dinges) verlagern. Und wegen der Tendenz zur kinetischen Homogenität der Randes, gehören sie zusammen und tragen der Einheit des Dinges bei. So, anstatt einer kaleidoskopischen Aenderung von wachsender und schrumpfender Gestalten, nimmt man ein Ding, das sich inmitten ruhender Dingen bewegt, wahr.

So sind wir, von einer Wahrnehmungstäuschung ausgehend, zu einem Beitrag zur Optischen Bewegungwahrnehmungslehre gelangen.

Ich will Ihnen noch eine dritte Täuschung demonstrieren und wenn möglich kurz erörtern.

Was sehen Sie?

Wollen sie sich bitte der Vorlage nähern?

Noch näher, bitte

Nun wollen Sie ~~xxxx~~ mit dem Zeigefinger das linke Quadrat berühren?

Wir sehen also eine Oberfläche Wo tatsächlich ein Loch ist. Man könnte sagen, dass, was man in diesem Fall wahrnemmt das Gegenteil des Ganzfeldphänomens ist; beim Ganzfeld sieht man nicht eine Oberfläche, die man vor den Augen hat, während in unserem Fall man eine Oberfläche whrnimmt die in der Vorlage fehlt.

Man hat natürlich alle Bedingungen des Phänomens wariert. Die einzige "conditio sine qua non" um das Effekt zu erzeugen ist die Homogenität der Fläche die sich hinter dem Loch befindet. Wenn die genamte Oberfläch strukturiert ist oder inhomogen ist (es braucht auch nur ein Halbschatten darüber zu fallen) verschwindet die Tauschung - man sieht ein Loch, und dadurch, in einem gewissen Abstand, eine Oberfläche. Die Erklärung des Phänomens liegt bei. Ein Loch ist eine Erscheinung die sich gegen das Gesetz der einseitingen Wirkung der Kontur durchsetzten.

Wenn keine andere Bedingungen dagegen wirken, gohört die Kontur der inneren und nicht der äusseren Region und es entsteht eine Figur, die auf ~~ihrem~~ einem Grund liegt. Wenn wir das Problem vom Standpunkt der proximalen Reizung betrachten wollen, stellt es sich aus, dass im Falle des Loches mit homogenem Hintergrund und im Falle eines dünnen homogen gafärbten Papierstückes das auf einem andersfärbigen Grunde geklebt ist, die Reizung identisch ist. Wenn aber der Grund hinter dem Loch und das Stück Papier inhomogen sind (z.B. Mosaikartig sind oder irgend eine Zeichnung drauf haben) dann ist die Reizung nicht mehr dieselbe, da im Falle des Loches die Reizung in den zwei Netzhauten verschieden ist, und deshalb eine dreidimensionelle Wahrnehmung stattfindet.

Ich muss gestehen dass ich bisher noch nicht im Stande bin, den dritten Schritt zu machen, und die Wichtigkeit der Erscheinung für die optische Raunwahrenehmung zu zeigen. (Hoffentlich würden wir in diesem Fall nicht 15 Jahre brauchen um das Problem zu erweitern.

Es ist aber vielleicht interessant ~~meine~~ die Schilderung zu ergänzen, und erzählen, dass eine Mitarbeiterin von mir,

Dr. Cavedon, im Stande gewesen ist, die gegenteilige Täuschung zu realisieren: unter gewissen Unständen sehen die Versuchspersonen ein Loch wo kein Loch ist. Leider ist in diesem Fall die Demonstration ein wenig Komplizierter und ich war nicht im Stande ohne der Hilfe von Frau Cavedon sie aufzustetten. Andere interessante Beobachtungen wurden in Bezug auf das Lochproblem gemacht. So z.B. einem jungen Professor unserer Arbeitsgruppe sind wir folgender Beobachtung schuldig: wenn der Unterschied der Albedo angrenzeuder Flächen sehr klein ist, entsteht eine Art Nebel vor dem Gebilde. Und wieder eine interessnte Ausnahme im Falle des Lochproblems : wenn das Loch tief schwarz ist (was man mit einer mit schwarzem Samt gefütterten Schachtel, dicht hinter dem Loch erhält) sieht man immer ein Loch.

Die Bedeutung der Wahrnehmungstäuschungen für die Theorie und die Forschung

Die Funktion der Wahrnehmungstäuschungen in der Forschung

Mein Vortrag betrifft die Wahrnehmungstäuschungen. Es ist deshalb vielleicht angemessen mit einer Definition anzufangen. Nach einem berühmten Spezialisten dises Gebietes, Professor Edwin Rausch ist von Täuschung zu sprechen sofern die Verhältnisse (~~die metrischen Verhältnisse im Falle der Geometrikoptischen Täuschungen~~) der wahrgenommenen Konfiguration sich von den zugehörigen Verhältnissen der Vorlagekonfiguration unterscheiden. Hier verde ich aber nicht von geometrisch-optischen Täuschungen sprechen, sondern von Wahrnehmungstäuschungen im weiteren Sinne.

Da wir nun das Gegenstandsgebiet festgestellt haben, kommt fast von sich selbst eine natürliche Frage. Warum haben die Wahrnehmungstäuschungen einen besonderen Platz in jedem Handbuch der Psychologie? Sind sie wirklich so bedeutend, oder handelt es sich schliesslich um unwichtige kleine Probleme die nur ein Pedant zum Objekt einer besonderen Forschung wählen sollte?

Ein so radikaler Standpunkt wurde von einem grossen Psychologen, unserem lieben verstorbenen Freund James Gibson vertreten. Ich war einer anderen Meinung und habe öfters mit ihm, freudlich aber lebhaft diskutiert. Das letzte Mal, wenige Monate vor seinem Verschieden.

Ich glaube dass ein besonderer Grund besteht ~~um~~ die Wichtigkeit der Wahrnehmungstäuschungen zu betonen.

Am Anfang hat man die Täuschungen nur deshalb studiert, weil sie Ausnahmen bildeten, in denen unsere Sinnesapparate nicht richtig funktionierten, so dass sie uns nicht, wie immer, richtige Auskünfte über die Wirklichkeit gaben. Man studierte die Täuschungen eben als Täuschungen, an und für sich, als kleine, interessante Probleme, ~~Am Anfang war~~ Man war sogar überzeugt, dass uns die Sinnesapparate nie täuschten. Man versuchte deshalb welche höhere Funktionen (Urteile, Gedächtnissbilder) mit den Gegebenheiten der Sinnesapparate interferierten und die Ursachen des falschen Wahrnehmungsbildes waren.

~~Üblicher Weise hat man~~ Man hat also die Täuscnungen als Ausnahmen betrachtet, in denen unsere Sinnesapparate oder unsere Wahrnehmungsprozesse nicht richtig funktionieren, ~~so dass sie uns nicht, wie sonst immer, richtige Auskünfte über die Wirklichkeit geben~~. Doch kann man das Problem der Wahrnehmungstäuschungen in einer ganz anderer Weise betrachten. Nach diesem Standpunkt sind die W.T. eine Art Alarmsignale, Zeichen von Maschenauslösungen, Brüche in dem Panzer unseres naiven Realismus, durch die man die Verschiedenheit von Phänomenalen und Realen direkt begreift. Und die Funktion der Wahrnehmungstäuschungen ist, uns zu zwingen, ein Problem zu sehen, wo früher kein Problem zu bestehen schien.

Es ist für mich immer interessant gewesen, zu bemerken dass nicht nur die Laien, sondern auch die Sachverständige, die von der Verschiedenheit des phänomenalen vom realen (Milieu) überzeugt sind, im gewöhnlichen Leben und Verhalten das Denken des naiven Realisten natürlischer Weise übernehmen. Es ist scheinbar notwendig für uns im praktischen Leben die Unterscheidung zwischen Wahrnehmungs

welt und Realität (Koffka's "behavioral" und "geographical" Environment) zu ignorieren oder weigstens zu vernachlässigen.

Wir haben eine typische Weise, uns zu verteidigen, und das Realismus ansprecht zu erhalten. Wenn wir auf einer Stufe stolpern, sagen wir ganz einfach dass wir die Stufe nicht gesehen oder nicht bemerkt haben. Und dasselbe sagen wir im tragischen Fall, dass wir mit dem Auto einen Radfahrer überfahren. Das bedeutet ganz einfach dass die Stufe, oder der Radfahrer in unserer Wahrnehmungswelt nicht existierte. Wir meinen aber, dass wir den betreffenden Gegenstand hätten sehen können, wenn wir nur unsere Blickrichtung geändert oder unsere Aufmerksamkeit konzentriert hätten. Was wir in diesen Fällen meinen, ist dass das Apparat richtig funktionnierte, und wir es nicht richtig gebraucht haben.

Es gibt aber Fälle, gerade die Wahrnehmungstäuschungen, wo Blickrichtung und Aufmerksamkeit nicht helfen, um, was wirklich dabei ist, wahrzunehmen. Wann wir an das Wertheimer Metzger'sche Ganzfeldphänomen denken, da gibt es kein Auswegs, keine Weg-erkärung. Vor uns steht eine Wand, und wir sehen Nebel; und das Phänomen besteht, so viel wir auch unsere Aufmerksamkeit konzentrieren. Dann gerät das naive Realismus in eine Krise. Man muss erklären warum, obwohl die Wand vor uns steht, wir sie nicht sehen.

Zuerst ist man geneigt die Lösung der Täuschung als spezielles, begrenztes Phänomen an erforschen. Die Frage lautet:

warum hat in jenem besonderen Fall das Wahrnehmungsapparat, das in der Regel eine treue Reproduktion der Realität wiedergibt, nicht regelmässig funktioniert?

So wird für jede Wahrnehmungstäuschung eine verschiedene Lösung gefunden. Es ist wie eine Mauer wo ein Stück vom Mörtelüberzug gefallen ist. Man reparierd es, so dass die Farbe homogen ist und kein Fehler mehr, wenigstens für den oberflachlichen Beobachter, zu sehen ist. Das selbe kann ein zweites, ein drittes Mal und noch öfters vorkommen. Aber früher oder später fällt der ganze Mörtelüberzug hinunter und mit grosser Überraschung und Freude entdeckt man, das unter dem Überzug ein Fresko verborgen war.

So was geschieht, früher oder später oder später, wenn man eine Wahrnehmungstäuschung untersucht. Kehren wir zur Ganzfelderscheinung zurück. Zuerst fragt man sich warum man im diesem Falle die Wand nicht sieht. Aber auf einmal erweitert sich das Problem. Man fragt sich nicht nur unter welchen Bedingungen man Nebel, statt einer Wand, wahrnimmt, sondern auch unter welchen Bedingungen man eine Wand sieht wenn eine Wand sich wirklich vor uns befindet. Wieso sieht man in diesem Fall die Farbe an einer Oberfläche kondensiert, und vor dieser Oberfläche den farblosen durchsichtigen Raum? Und warum soll das Problem nur die Wand betreffen? Unter welchen Bedingungen sehen wir einen Sessel, ein Pult, ein Buch wenn diese Gegenstände vor uns liegen?

In diesem Sinne sind die Wahrnehmungstäuschungen kostbare Anzeichen, die uns zwingen ein Problem zu erkennen wo gewönlich

kein Problem zu bestehen scheint und alles sich als natürlich bietet. In diesem Sinne haben die Wahrnehmungstäuschungen zur Geburt der Wahrnehmungspsychologie beigetragen, und haben uns Wahrnehmungspsychologen überzeugt (ich glaube wenigstens die meisten von uns) dass die Wahrnehmungswelt - die einzige Welt mit der wir in direktem Kontakt sind - all eine Gesamtheit von Problemen ist, die entdeckt werden müssen (und das ist eine ernste, nicht übersehebare Schwierigkeit) bevor man sie zu lösen anfängt.

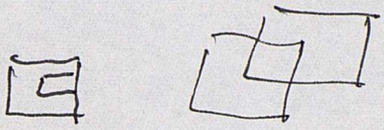
Mit dieser Behauptung ist der theoretische Teil meines Vortrags zu Ende. Nun möchte ich versuchen aus einigen Untersuchungen über Wahrnehmungstäuschungen - die von meiner Forschungsgruppe stammen - die Entwicklung ~~jedes~~ des Problems nach dem vorher gesagten zu folgen, nämlich zeigen wie aus einem beschränkten, speziellen Problem sich eine allgemeinere Problematik entwickelt.

~~Das erste~~ mein erstes Beispiel betrifft die Durchsichtigkeitswahrnehmung, ein Gegenstand dem ich mich sehr lange gewidmet habe.

Wenn ich sage, dass meine experimentelle Forschung die Durchsichtigkeitphänomene betrifft, hat man mir oft erstaunt eingewändet: "Wieso kann ein Psychologe die Durchsichtigkeit erforschen? Die Durchsichtigkeit ist ja ein physikalisches Phänomen. Ein Ding oder ein Medium ist durchsichtig wenn es die Lichtstrahlen durchkommen lässt; es kann sämtliche Strahlen durchgehen lassen, oder einen Teil einsaugen, oder nur gewisse Wellenlängen durchlassen. Was ich nicht einsehen kann, ist wo man, in diesem Gebiet, ein Wahrnehmungs Problem vorfindet, das sich von den üblichen Problemen der Gesichswahrnehmung unterscheidet.

Ich denke, dass mehere meiner Zuhörer diesen Standpunkt teilen. Ich glaube, dass eine sehr einfacher Demonstration der beste Weg ist, sie zu überzeugen dass die Durchsichtigkeit ein echtes Wahrnehmungsproblem ist.

- Vorlage 1 - 2



Sieht jemand etwas durchsichtiges hier? und hier? - Vorlage - Und doch ist die rote Schicht eine physikalische durchsichtige Plastik, während hier nur ein Mosaik undurchsichtiger verschieden-farbiger Pappenstücke ist.

a) Man ist also berechtigt daraus zu schliessen dass die physikalische Durchsichtigkeit weder eine ausreichende noch eine notwendige Bedingung der Durchsichtigkeitswahrnehmung ist.

Hier hat sich gezeigt dass eine Täuschung ein Mittel sein kann zu beweisen dass der naive Realismus falsche Schlüsse erzwingen und Wahrnehmungsprobleme tarnen kann. - Vorlage -

b) Ich will noch einen Schritt machen. Hier sieht man eine undurchsichtige, rötliche Figur (das Wissen hat ja im Allgemeinen keinen Einfluss auf die Wahrnehmung), und hier auch. Wenn man aber die zwei Vorlagen zusammen stellt, wird auf einmal die resultierende einheitliche Figur durchsichtig.

Was können wir daraus schliessen? Dass die Durchsichtigkeitswahrnehmung von der Wirkung einer Komplexeen Reizung auf unsere Netzhaut abhängt. Man ist berechtigh (meiner Meinung nach) von einem Feld - oder Gestaltphänomen zu sprechen.

c) Die Täuschung ist in diesem Fall auch ein Mittel, das Phänomen zu erforschen. Man braucht nur, wie meine Mitarbeiter und ich gemacht haben, die Form und die Farben der Vorlage systhematisch zu ändern, um die notwendigen Bedingungen der Durchsichtigkeitswahrnehmung zu entdecken.

Wir sind aber vielleicht von unserem ursprünglischen Thema abgekommen entgleisst. Ich wollte Ihnen, mit diesem Beispiel zeigen, dass die Analyse einer Täuschung zu einer Umkehrung des Gesichtspunktes führen kann, so dass nicht die Täuschung, sondern das ganze Gebiet, und besonders, die Wirklichkeitstreuen Wahrnehmungen zum Problem werden.

Zu diesem Zweck geht man am besten von einem (dem) begrenzten Problem der Täuschung (in diesem Falle der Durchsichtigkeitstäuschung) aus. Warum täuscht uns diese Figur? Man kann von der üblichen Hypothese ausgehen, dass es ein Erfahrungseffekt ist. Wir wollen aber nicht diesen Aussichtlosen Weg folgen. Wie oben gesagt, beginnt man, die Form und die Farben systhematisch zu

d) ändern, um die notwendigen Bedingungen der Täuschung zu entdecken. Auf einmal aber wird es dem Forscher klar, dass die notwendigen Bedingungen nicht nur für die Täuschung, für den Fall der scheinbaren Durchsichtigkeit gelten, sondern auch für den Fall der physikalischen Durchsichtigkeit. Und dann studiert man die Durchsichtigkeits-Wahrnehmung abgesehen vom nebensachlichem Problem, ob es sich um die wirkliche oder die scheinbare Durchsichtigkeit handelt.

Ich will Ihnen ein anderes Wahrnehmungseffekt zeigen.

- Vorlage -

Scheinruhe

Wollen sie so ~~höflich~~ freundlich sein, ganz einfach zu beschreiben was Sie sehen?

Sehen auch die anderen Damen und Herren das selbe?

Es handelt sich auch hier um eine Wahrnehmungstäuschung die ich Scheinruhe genannt habe.

Ich glaubte den Effekt entdeckt zu haben, aber er wurde vor mir von ~~Werner~~ Wittmann (1920) Werner (1928) beobachtet und vor Werner von Wittmann in Jahre 1920. (Richtung der Aufmerksamkeit)

Beide Wissenschaftler beobachteten das Phänomen an der Maxwellschen Scheibe. ~~Als~~ Wenn die Scheibe noch nicht schnell dreht, so dass man noch nicht die Vorstufen der Schmelzung beobachtet, oder wenn sie langsam dreht weil man den Strom ausgeschltet hat, sieht man einen Sektor auf einer ruhenden einfärbigen Scheibe sich drehen.

ich StereoKinese

1 Aber, während sowohl Wittmann wie Werner an den Bedingungen der Maxwellschen Scheibe stecken geblieben sind, habe ich alle ~~alle Veranderlichen~~ Variabeln systematisch verändert (Form, Farbe, (Bewegung - auch geradlinig) u.s.w.) und bin zum Schluss gekommen, dass die einzige notwendige Bedingung des Phänomens war, dass mindestens ein Teil der Kontur der Bahn der Bewegung entsprach.

alle Variabeln verändert

~~Bisher scheint es sich nur um die Erforschung eines Kur~~ ~~Widsum zu handeln.~~ ~~Tatsachlich~~ Ich habe ~~ich~~ mich zuerst - es war eine ~~der~~ meiner ersten ~~Veröffentlichungen~~ Forschungen - beschränkt das Problem in dieser begrenzten Weise zu erforschen. Ich hatte aber den Eindruck dass mir das Wesen des Problems entgangen war.

man kann verhalb einer einfachen Vorlage brauchen wo man das selbe Phänomen, wenn auch in einer weniger zwingenden Form, beobachten kann

In diesem Fall kann ~~man~~ ich, in der historischen Entwicklung ~~der~~ meiner Forschung, drei verschiedene Stufen Unterscheiden. Die

× erlaubt eine stabile Form der Täuschung entwickelt (meiner Meinung nach ist der erste Schritt in der Erforschung einer Täuschung die Tauschung ganz deutlich beobachten zu können und dann (eine Form der Tauschung zu erfinden, in der man)

erste, bisher beschriebene Stufe, ist die Begrenzte Erforschung der Täuschung, um deren notwendige Bedingungen zu ermitteln.

2. Schritt. Nach vielen Jahren (15) dünkte es mir, dass eine Betrachtung des Effektes am Niveau der proximalen Reizung, neue Einsicht in das ~~(neues Licht) dem~~ Problem bringen könnte.

Welche Änderungen in der proximalen Reizung - an der Netzhaut - werden von der Bewegungsgang ~~den verschiedenen Änderungen an~~ der Vorlage verursacht? Das kann als die zweite Stufe der Forschung gelten. Und hier auf einmal die grosse Überraschung. (Da habe ich - zu meiner Erstaunung bemerkt, dass die) ~~Die~~ Täuschende Vorlage, die Scheinruhe verursacht, und eine übereinstimmende Vorlage, die echte Ruhe der Korrespondierenden Teile der Vorlage verwirklicht, ~~verursachen~~ die selbe Reizung verursachen. - Vorlage -

Die Täuschende Vorlage reproduziert die Reizung einer nicht täuschenden Vorlage. Die Täuschung stellt also kein Problem: ~~unser~~ das Problem ist ganz einfach verschwunden.

3. Schritt. Doch bleibt etwas zu erklären. Warum sehen wir - im Falle der täuschenden sowie im Falle der nicht täuschenden Vorlage - ein~~en~~ Rechteck, d~~es~~ auf einem ruhenden Kreis rotiert, und nicht einen Halbkreis der zusammen mit dem Rechteck rotiert?

Hier beginnt die dritte Stufe: die heuristische Funktion der Täuschung ~~wird~~ beginnt klar zu werden. Das Problem hat sich erweitert: es betrifft nicht mehr nur die Täuschung, sondern auch ~~die Fälle in denen~~ einen Fall in dem keine Täuschung stattfindet, wo die Wahrnehmung uns eine treue Wiedergabe der Vorlage verschafft.

Ich glaube dass man eine Lösung finden kann, wenn man (das Problem erweitert und) sich fragt was auf der Netzhaut stattfindet

a)

Beginnen wir also mit der Lösung des beschraenkten Problems des Auseinanderfallens unserer Vorlage in zwei Figuren, einen Kreis und einen Rechteck. Hier sind die Tatsachen sehr komplifiziert; ich werde sie euch in eure vereinfachte Weise vorlegen.

Man soll erstens hervorheben, dass keine Bewegung an der Netzhaut stattfindet. Es gibt nur annaehernd gleich gereizte Flaechen, die sich teilweise aendern, sie wachsen von einer Seite und Schrumpfen ~~von einer~~ an der anderen Seite. Die Raender (die Reizsprünge zwischen zwei verschieden gereizten Flächen) verhalten sich aber anders: manche verlagern sich und manche nicht. Ein einleuchtendes Beispiel ist ein farbhomogener Kreis, der um sein (sein Mittelpunkt) ~~zentrum~~ rotiert. Seine Raender verlagern sich nicht. Die Netzhautprojektion einer solchen Figur verursacht keine Reizaenderung: die Figur wird als ruhig wahrgenommen.

Es ist deshalb angemessen zwischen zwei Arten Raender zu unterscheiden: Kinetisch wirksame und kinetisch unwirksame Raender. Kinetisch wirksam sind die Raender die sich auf der Netzhautprojektion verlagern, waehrend kinetisch unwirksam sind die Raender die sich in der Netzhautprojektion nicht verlagern.

Nun sind wir im Stande zu analysieren, was im Falle unserer und aehnlicher Vorlagen geschieht: die retinale Projektion unserer Vorlage hat sowohl kinetisch wirksame wie kinetisch unwirksame Raender - sie hat kinetisch unhomogene Raender. Was wir aber wahrnehmen, sind zwei Figuren, von denen jede kinetisch homogene Raender hat, naemlich ~~ein~~ einen Kreis mit kinetisch unwirksamen Raendern, und ein Rechteck mit kinetisch wirksamen Raendern.

Es hat sich also eine Tendenz zur kinetischen Homogenitaet der Raender herausgestellt.

Und nun ein Schritt zur allgemeinen Problematik, zu der unsere Analyse der Täuschung geführt hat.

der Netzhaut bewirken, oder wachsen von einer Seite und schrumpfen von einer anderen. Und das gilt wieder auch für alle ruhenden Gegenstände, deren Ränder deshalb der Klasse der kinetisch unwirksamen gehören.

Wie können wir, von dem Charakter der Grenzen ausgehend das Abbreschen unserer Vorlage in einem ruhenden Kreis und einem rotierenden Rechteck beschreiben? Ganz einfach: Durch die Bewegung entstehen zwei Gebilde, dessen jedes kinetisch homogene Ränder besitzt. Man kann durch naheliegende Experimente feststellen, welche Resultate man unter verschiedenen Bedingungen erhält.

Aber hier interessiert uns das erweiterte Problem. Wir haben eine Tendenz zur kinetischen Homogenität der Ränder festgestellt. Was geschieht wenn sich ein Gegenstand bewegt in einem Felde das von verschiedenen unregelmässingen und auf einander gelegten Dingen besetzt ist? Auch in diesem Fall können wir zwischen Rändern die entweder keine Änderung am Niveau der Netzhaut bewirken, oder sich ausdehnem und schrumpfen, und andere, die kinetisch Wirksamen, die sich verlagern. Es ist seit langem bekannt dass die physikalische Bewegung nicht als Reiz für die Bewegungswahrnehmung wirken kann. Also betrachten wir was am Niveau der Netzhaut verkommt. Die Bewegung des Gegenstandes bewirkt ein Wachsen und Schrumpfen mehrerer verschieden gereizter Flächen am Sinnesorgan. Die Grenzen zwischen den verschieden gereizten Flächen bleiben ständig oder wachsen und schrumpfen (auch die Konturen der ruhenden Dingen, die von dem bewegten Ding zeitlich gedeckt werden, wachsen und schrumpfen). Aber die Konturen des

bewegten Dinges sind die einzigen die sich (ausgenommen den sehr seltenen Fall der Korrespondenz eines Teiles mit der Traiektorie des Dinges) verlagern. Und wegen der Tendenz zur kinetischen Homogenität der Randes, gehören sie zusammen und tragen der Einheit des Dinges bei. So, anstatt einer kaleidoskopischen Aenderung von wachsender und schrumpfender Gestalten, nimmt man ein Ding, das sich inmitten ruhender Dingen bewegt, wahr.

So sind wir, von einer Wahrnehmungstäuschung ausgehend, zu einem Beitrag zur Optischen Bewegungwahrnehmungslehre gelungen.

Ich will Ihnen noch eine dritte Täuschung demonstrieren und wenn möglich kurz erörtern. Vorlage

Was sehen Sie?

Wollen sie sich bitte der Vorlage nähern?

Noch näher, bitte

Nun wollen Sie mit dem Zeigefinger das linke Quadrat berühren?

Wir sehen also eine Oberfläche wo tatsächlich ein Loch ist. Man könnte sagen, dass, was man in diesem Fall wahrnimmt das Gegenteil des Ganzfeldphänomens ist; beim Ganzfeld sieht man nicht eine Oberfläche, die man vor den Augen hat, während in unserem Fall man eine Oberfläche wahrnimmt die in der Vorlage fehlt.

Man hat natürlich alle Bedingungen des Phänomens variiert. Die einzige "conditio sine qua non" um den Effekt zu erzeugen ist die Homogenität der Fläche die sich hinter dem Loch befindet. Wenn die genannte Oberfläche strukturiert ist oder inhomogen ist (es braucht auch nur ein Halbschatten darüber zu fallen)

verschwindet die Tauschung - man sieht ein Loch, und dadurch, in einem gewissen Abstand, eine Oberfläche. Die Erklärung des Phänomens liegt ~~bei~~ nahe. Ein Loch ist eine Erscheinung die sich gegen das Gesetz der einseitingen Wirkung der Kontur durchsetzt. Wenn keine andere Bedingungen dagegen wirken, gehört die Kontur der inneren und nicht der äusseren Region und es entsteht eine Figur, die auf einem Grund liegt. Wenn wir das Problem vom Standpunkt der proximalen Reizung betrachten wollen, stellt es sich ~~aus~~ heraus, dass im Falle des Loches mit homogenem Hintergrund und im Falle eines ~~dünnen~~ homogen gefärbten Papierstückes das auf einem andersfärbigen Grunde geklebt ist, die Reizung identisch ist. Wenn aber der Grund hinter dem Loch und das Stück Papier inhomogen sind (z.B. Mosaikartig sind oder irgend eine Zeichnung darauf haben) dann ist die Reizung nicht mehr dieselbe, da im Falle des Loches die Reizung in den zwei Netzhauten verschieden ist, und deshalb eine dreidimensionelle Wahrnehmung stattfindet.

Ich muss gestehen dass ich bisher noch nicht im Stande bin, den dritten Schritt zu machen, und die Wichtigkeit der Erscheinung für die optische Raumwahrnehmung zu zeigen. (Hoffentlich werden wir in diesem Fall nicht 15 Jahre brauchen um das Problem zu erweitern.

Es ist aber vielleicht interessant die Schilderung zu ergänzen, und erzählen, dass eine Mitarbeiterin von mir, Dr. Cavedon, im Stande gewesen ist, die gegenteilige Täuschung zu realisieren: unter gewissen Unständen sehen die Versuchspersonen ein Loch wo kein Loch ist. Leider ist in diesem Fall die Demonstration ein wenig Komplizierter und ich war nicht im Stande ohne der Hilfe

von Frau Cavedon sie aufzustellen. Andere interessante Beobachtungen wurden in Bezug auf das Lochproblem gemacht. So z.B. einem jungen Professor unserer Arbeitsgruppe ~~sind~~ verdanken wir folgender Beobachtung ~~schuldig~~: wenn der Unterschied der Helligkeit Albedo angrenzeuder Flächen sehr klein ist, entsteht eine Art Nebel vor dem Gebilde. Und wieder eine interessante Ausnahme im Falle des Lochproblems: wenn das Loch tief schwarz ist (was man mit einer mit schwarzem Samt gefütterten Schachtel, dicht hinter dem Loch erhält) sieht man immer ein Loch. und nicht eine Oberfläche: die Farbe ist eine Flächenfarbe im Sinne von Katz.

coercitiv = zwingend, erzwingend

METRIC TABLES

Linear Measure. (Length)

1,000 micrometres	=	1 millimetre (mm)
10 millimetres	=	1 centimetre (cm)
10 centimetres	=	1 decimetre (dm)
10 decimetres	=	1 metre (m)
10 metres	=	1 decametre (dam)
10 decametres	=	1 hectometre (hm)
10 hectometres	=	1 kilometre (km)

Measures of

1,000 microgrammes	=	1 milligramme (mg)
10 milligrammes	=	1 centigramme (cg)
10 centigrammes	=	1 decigramme (dg)
10 decigrammes	=	1 gramme (g)
10 grammes	=	1 decagramme (dag)
10 decagrammes	=	1 hectogramme (hg)
10 hectogrammes	=	1 kilogramme (kg)
1,000 kilogrammes	=	1 tonne

Measures of volume and capacity.

10 millilitres (ml)	=	1 centilitre (cl)
10 centilitres	=	1 decilitre (dl)
10 decilitres	=	1 litre (l)
10 litres	=	1 decalitre (dal)
10 decalitres	=	1 hectolitre (hl)
10 hectolitres	=	1 kilolitre (kl)

Square measure or area.

1 Are	=	100 square metres
1 Decare	=	10 ares
1 Hectare	=	100 ares
1 Deciare	=	1/10 of an are
1 Centiare	=	1/100 of an are
	=	1 square metre

CONVERSION

1 metre	=	39·37 inches
1 litre	=	1·76 pints
1 kilogramme	=	2·2046 pounds
1 hectare	=	2.471 acres
° Centigrade	=	(°F −32) × 5/9

1 inch	=	2·54 centimetres
1 pint	=	0·568 litre
1 pound	=	453·59 grammes
1 acre	=	0·4047 hectares
° Fahrenheit	=	(°C × 9/5) + 32

VOLUME

Cube: l^3, (l = length of one side).
Sphere: $\frac{4}{3}\pi r^3$, (r = radius).
Cylinder: $\pi r^2 l$,
(r = radius, l = length).
Rectangular prism: $l \times b \times h$,
(l = length, b = breadth, h = height).
Cone: $\frac{1}{3}\pi r^2 h$,
r = radius of base, h = vertical height.
Pyramid: $\frac{1}{3}$ area of base × h,
(h = vertical height).

AREA AND MENSURATION

Rectangle area = base × height.
Parallelogram area = base × perpendicular height.
Triangle area = $\frac{1}{2}$ base × height.
Circle area = πr^2 (r = radius).
Circumference of Circle = $2\pi r$.
Area of sphere = $4\pi r^2$.
Area of curved surface of cylinder = $2\pi rh$,
(r = radius, h = height).
$\pi = 3{\cdot}14159$.

SI (Système International) UNITS

Mass: the kilogramme (kg)
Length: the metre (m)
Time: the second (s)
Force: the newton (N)
Electric current: the ampère (A)
Luminous intensity: the candela (cd)
Absolute Temperature: the degree kelvin (°K)

The kilogramme is the weight of 1 litre of pure water at 4°C under normal atmospheric pressure (760 mm Mercury).
The litre is equivalent to 1000·028 cubic centimetres.

Degrees Kelvin (°K) = Degrees Celcius (°C) plus 273·15
Degrees Celcius are the same as Degrees Centigrade
Freezing point of water = 0°C = 273·15°K
Absolute Zero = 0°K = minus 273·15°C

Muller - Lyer
forma nuova apparato
lavoro Cavezzan
sul fazo

Silvine

Reg. Trade Mark

EXERCISE BOOK

Appunti
Castelvecchio
(relazione fatta a fine aprile
1983)

Name.....

Subject.....

REF 130

139

~~Tem~~ La percezione del "mondo esterno"
Il mondo delle cose
con cui siamo direttamente a contatto

I diversi modi di vedere la realtà: come la vedono i filosofi
gli artisti, i diversi scienziati (biologi, geografi, fisici)
Il mondo come lo vediamo e come lo studiano gli psicologi
o più precisamente i percettologi.
~~Vari modi di vedere i problemi percettivi~~.
Il presupposto realistico
Realtà costruita e realtà percepita (Ranzoli)
La percezione come conclusione di una catena di processi
a partire dalla stimolazione degli organi di senso.
L'oggetto fisico (o "bersaglio") e l'oggetto percettivo.
Ha senso questa distinzione? Non sono la stessa cosa?
Il realismo ingenuo
critico a) trovare alla fine della serie di processi
quello che era al principio
La distinzione fra mondo percettivo e mondo empirico
Le illusioni più comuni – Le illusioni sensoriali
Il tentativo di sostenere che gli strumenti percettivi sono
mezzi di informazione. La cellula è uno strumento
di informazione o semplicemente il risultato di una
serie di processi fisico-chimici? E se è così, perché
un aggregato di cellule dovrebbe essere uno strumento
di informazione?

Il punto di vista informazionistico porta inoltre nuovamente ad una frammentazione. Il sistema nervoso è, come i diversi strumenti di informazione inventati dall'uomo, costruito per un dato scopo.

Il punto di vista gestaltistico non perde di questo pregio importante. Si tratta di un insieme di processi fisici dinamici che hanno ~~delle~~ delle caratteristiche in gran parte ignote, e che portano fra altro alla percezione e alle sue caratteristiche.

Ma perché in generale il mondo percettivo e il mondo empirico si comportano così bene dal pettinar entro certi limiti il materiale informativo?

Secondo me per ragioni di selezione naturale. Ma la selezione naturale può spiegare il fatto della sopravvivenza di organismi con determinate caratteristiche, ma non il modo in cui funzionano. Questo resta da scoprire.

L'informazionismo parte invece dal presupposto che gli organismi sono strumenti di informazione, e si trova a dover spiegare in modo particolare gli errori di informazione. L'informazione presuppone che gli strumenti siano in grado veritiero della realtà.

Il rifiuto del realismo ingenuo porta ad una conseguenza importante: la pluralità dei mondi percettivi. Il realismo ingenuo può trovare una linea di difesa sostenendo che percepiscono tutti lo stesso mondo o diversi posti, nello stesso mondo e quindi la relatività fra i diversi mondi percettivi individuali risulta priva di senso.

A questo punto è utile prendere in considerazione la percezione degli animali. L'esempio più drammatico è quello della zecca che ha solo la possibilità di cogliere l'emanazione della pelle di un mammifero, ma anche gli esempi di animali molto più vicini al l'uomo, ~~offerti~~ descritti nel classico volume di v. Uexkuell possono servire a questo scopo. Non è vero che vediamo tutti le stesse cose, ma anche se posti esattamente ~~alle~~ nelle stesse condizioni, vediamo cose più o meno diverse.

Si potrebbe rispondere che gli strumenti di osservazione di cui ogni uomo, uomo o animale, dispone sono diversi, e quindi, anche posti nella stessa maniera in cui sono assai, possono cogliere aspetti diversi della realtà.

Ma a questo punto vanno considerati quei casi in cui si percepisce qualche cosa di diverso pur a parità di condizioni percettive.

Untitled

seems

The function of the perceptual illusions in research

Having to speak about perceptual illusions, it seems well to begin with a definition. We speak of an illusion when the attributes of a perceived configuration differ from the corresponding characteristics of the target.

Let us give an example: the paper with the drawing is the target, and the a and b segments are equal as I draw them equal; but in the perceptual configuration they are unequal.

There are two ways of considering perceptual illusions. The more common one is to consider them exceptions, where ~~our~~ perceptual apparatus did not function well, and therefore it did not give us, as it always does, trustworthy information about the real world.

The other way is considering them as alarm signals, breaks in the cuirass of our naive realism, through which the difference between perceptual and real world becomes directly visible.

There is a natural tendency towards naive realism, that is to ignore the above difference and to think that what we see is the real world.

There are several ways to preserve our realism. So f. ex. when in a car accident the driver says that he did

So

drawer

not see the person crossing the way. What is meant in this statement is that he did not direct his look or his attention to the person: in other words, his perceptual apparatus did function well, only it had not been used the right way.

Perceptual illusions are important, because with perceptual illusions this type of explanation does not function.

Let us take the famous example of the Gestalt. There is a very big homogeneous wall in front of me and I see fog. No change of attention and of gaze direction helps. We have to explain why we do not see the wall, although it is in front of us.

We begin with looking for the solution of a special phenomenon. But soon or late our scope widens. The problem becomes more general. Why do we see a wall when there is a wall? Why do we see the color centered on a surface and empty transparent space before it? In other words not only the illusory perception but also the trustworthy one puts a problem.

This is the thesis I intend to illustrate with some examples: the function of perceptual illusions is to show us that the perceptual world is a set of

problems to be discovered ~~before and~~ first, and then to be studied and solved. My examples should show how, studying illusions, from a limited special problem a wider insight develops.

V

a) Transparency

My first example is transparency. First of all I have to meet the natural objection that the conditions for perceiving transparency are physical, that transparency is a physical and not a perceptual phenomenon. Than let us do a little experiment. (I) Do you see something transparent here? Well, there is nothing transparent here, only a mosaic of opaque pieces of cardboard. And here (II) Certainly not. But in fact the red plastic is transparent (III) So, I reached two results. First of all I showed that physical transparency is neither a necessary nor a sufficient condition for perceiving transparency. Obviously, because the visual system does not receive any information whether the light rays stimulating the retina are passing through a transparent layer or not. Second, therefore we can study the perception of transparency either with apparent or really transparent targets or in conditions of ~~real~~ physical transparency, at will.

Then, what gives rise to the impression of transparency? Let us do a little demonstration (IV) Now you see transparency where there was not. This experiment shows that transparency depends on a complex stimulation, as local stimulation did not change remained the same.

The result is that studying a perceptual illusion you obtain results which are valid also for a non illusory perception. You are free to use both illusory or non-illusory targets to study the perceptual phenomenon of transparency. The phenomenon being studied does not regard just an illusion, but a trustworthy perception as well.

~~Then~~, Having reached the proof that there is no link between physical and perceptual transparency, it is possible to study the perception of transparency either under conditions of physical transparency, or under conditions of apparent transparency. In other words, the phenomenon being studied does not regard just an illusion, but a trustworthy perception as well. According to the opportunity (that is, according to the conditions having to be ~~changed~~ tried) the illusory perception or the trustworthy perception can be used as a ~~target~~ display for research.

b) Apparent rest

There is a typical example of a special problem widening into a general one: The phenomenon called apparent rest.

(V)(VI) No time to do the experiment properly. People has in general a coercive impression of a resting circle successively visible in all of its parts

(a) Met this type of phenomenon as others did, working with a Maxwell disk; the first step of my study was looking for the necessary conditions. Through systematic variation I found that there was only one necessary condition: one part of the border has to correspond to the trajectory of a point. (The illusion can be obtained with rectilinear motion also).

(b) After years, having the impression not having explained the phenomenon, I put a new question "Which movements on the proximal stimulation (retina) are caused by the motion of ~~the~~ one of the above targets?" Let us take a simple one and via

Let us consider a simplified drawing (VII) Through rotation the retinal region stimulated by the a stimulus is decreasing on one side and increasing on the other. The contrary happens to the ~~b~~ region stimulated by b.

But let us see what happens on the retina if the stimulation is generated by a non-illusory target.

(VIII) (~~XX~~)

In fact, the stimulation is the same in both cases and therefore the perceptual result is the same.

The problem has disappeared

(c) But there is still a problem. Why do we see, in both cases a rectangle moving on a resting circle and not the whole configuration rotating?

(The problem has widened: it regards the perception of a moving object, not just an illusion.)

Let us consider a very simple situation: what happens on the retina when the target is an homogeneous figure moving on a homogeneous but differently colored ground. There is no motion of the proximal stimulus: there are only increasing and decreasing of homogeneously stimulated regions. Only the border, the line along which there is an abrupt change of stimulation, is shifting.

Now let us consider the encounter with another differently colored figure (IX). There happens to be a complicated exchange of decreasing ~~of~~ and increasing of the retinal regions stimulated by the target. But the difference regarding the retinal projection of the borders is net. The projection of the border of the moving figure is shifting, while the projection of the border of the resting figure is increasing and decreasing but not shifting.

(d) Now let us go back to our illusory figure. What happens of the borders of the apparently resting part of the configuration? They are increasing and decreasing, but resting, as the borders of the resting figure do. Then, in the special case of our figure, as in the general case of moving and resting objects, we ~~are~~ have two types of borders, which we shall call <u>Kinetically active</u> and <u>Kinetically not active</u>: the first ones only giving rise to the perception of a moving figure.

Our configuration gives rise to a retinal projection with both type of borders: in other words its borders are Kinetically <u>non homogeneous</u>. And what happens: the configuration splits into two figures, each with Kinetically homogeneous borders. The tendency through Kinetically homogeneous borders is all but exceptionally acting. Every time when a moving figure is passing in front of a resting one, a similar situation is arising at the retinal projection level: we are faced with a configuration with Kinetically inhomogeneous borders. And instead of a calendoscopic widening and shrinking figures, through the tendency towards Kinetically homogeneity of bor-

ders, a figure moving in front of a setting figure is perceived.

c) The disappearing hole

1) Demonstration: What do you see. Touch the rectangles beginning with the right one. (Demonstration without apparatus.)

We begin, as always, with varying ~~trys~~ conditions systematically. The only necessary condition result to be the homogeneity of the surface behind the hole.

Then, as usual, we considered the proximal stimulation, and it appeared that there was a difference between a piece of paper pasted on a cardboard and a hole only if the insides of the hole was inhomogeneous. In this case the difference was caused by retinal disparity (i.e. the location of the background of the hole on a different plane) and difference in focussing. Otherwise there was no difference and also in this case the problem seemed to disappear.

But there is still a question to be asked. Why do we see a paper pasted on a cardboard and not a hole? There is a well known quality of the border, the one sided function of the border, that normally outlines only insides and not outsides. But why the border is acting this way, is still an open question.

And then, a strange exception: if the inside of the hole is black, notwithstanding its homogeneity, it is perceived as a hole.

Research on this field has been carried on by Professor Da Pos, who discovered a strange fog phenomenon and by Dr Cavedon who has been able to obtain the opposite phenomenon, the perception of a non existing hole.

As ~~the time is~~ I have
For lack of time I skip the first part of my paper and confine myself in saying that the purpose of my demonstration is that studying thoroughly a perceptual illusion the problem widens and becomes general, where illusory as well as