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ON SIMULTANEOUS MASKING IN THE VISUAL FIELD

ABSTRACT. The concept of simultaneous masking in visual field is discussed, in the light of classical examples, of the various kinds of the phenomenon, of amodal completion, of the figure/ground phenomenon, of ambiguous and reversible figures, of mimicry and camouflage and eventually of the complexity of the stimulus. There is some reference to masking in auditory field. The “reality” of the masked configuration is discussed, drawing the conclusion that it is perceptually unreal. The fact that the masking phenomenon cannot take place without comparison between two perceptual acts – what we see at one moment and what we see a moment after LATER – and the fact that the masked configuration pops out with some surprise, lead to the conclusion that simultaneous masking in visual field is not a bare perceptual phenomenon, but a psychological process not unlike insight experience.

KEY WORDS: Perception, Vision, Audition, Masking, Amodal completion, Figure/ground, Ambiguous figures, Reversible figures, Mimicry, Camouflage, Insight

1. INTRODUCTION

Twenty years ago (1982) Kanizsa accepted my invitation to co-author a piece on simultaneous masking in the visual field. The result took the form of Report no. 57 of the Istituto di Psicologia dell’Università di Padova. We expressed there, and separately, our views on the phenomenon. Just two years later, Gerbino (1984a) edited the *Festschrift* for Kanizsa and presented his own contribution (1984b) to a correct description of masking. Finally, Kanizsa (1991) published a revised edition of the Padua report as the fifth chapter of his book *Vedere e pensare* [Seeing and Thinking]. I will summarize here the content of our discussions – mainly made up of figures in the best tradition of the Gestalt school – putting forward what appears to me the natural consequence of the opinions expressed in that text: simultaneous masking in the visual field is not a perceptual fact but a psychological process.



Axiomathes 13: 399–432, 2003.

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2. CLASSICAL EXAMPLES

Let us begin with some classic examples, in order to clarify the meaning of the locution “simultaneous masking in the visual field”, which is somewhat difficult to define. Generally speaking, masking – in the perceptual field – refers to any process whereby a detectable or recognizable stimulus (called *target*) is made difficult or impossible to detect or recognize by the presentation of a second stimulus (the *masker*). This does not concern sensory processes like forward or backward masking, but rather the fact that some visual configurations are not perceived when they are embedded, concealed or fragmented by other configurations simultaneously present in the field.

Figure 1 is by Wertheimer (1923) and shows that the hexagon of *Abbildung 38* is found with some difficulty in the other *Abbildungen*.

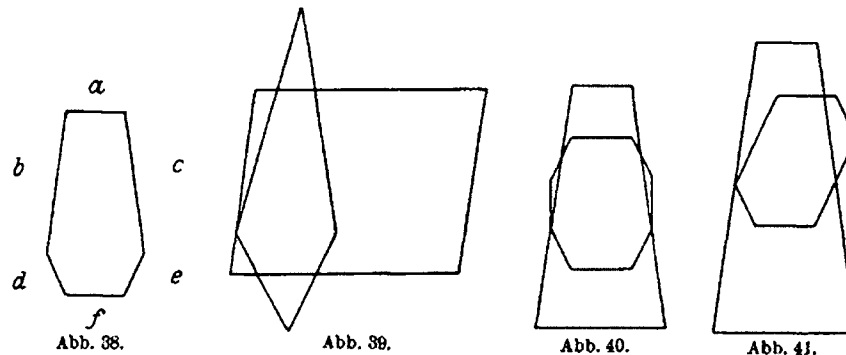


Figure 1.

Obviously enough, Wertheimer was seeking to show that the parts of the hexagon ($a - f$), when inserted in a more complex configuration, change their role. By virtue of the factors of unification (good continuity, closure etc.), they become parts of the new configuration, and therefore the old one is lost.

Figure 2 was devised by Gottschaldt (1926). The parallelepiped on the left was repeatedly administered to experimental subjects, but this forced experience did not improve their ability to find it in the configuration on the right. The example is considered of medium difficulty.

Figure 3 is the well-known example devised by Köhler (1947), who improved on figures already present in Wertheimer's paper. It is of no importance that we have had countless visual experiences of the digit “4”: when its parts are incorporated into another stronger configuration (at the left: two closed patterns and a line), it disappears. By contrast, when it is

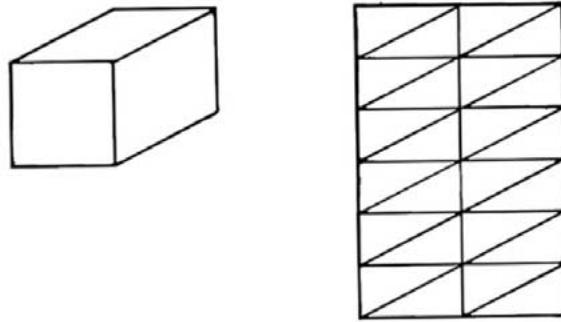


Figure 2.

inserted in a chaotic set of lines, in the absence of any strong factor of unification, it remains clearly visible.

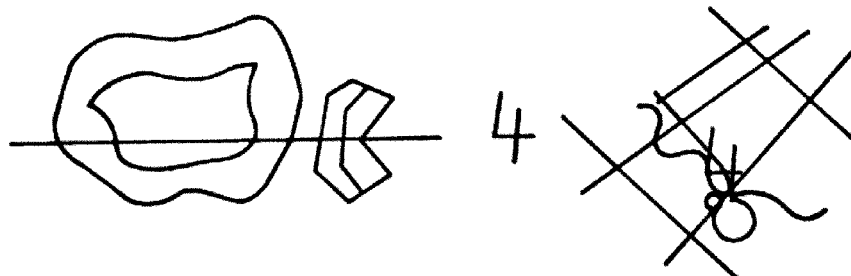


Figure 3.

Figure 4 is by Metzger (1952/1975), and is one of the most difficult instances of masking. Be sure, the task is difficult even for acute observers like Gestalt psychologists.

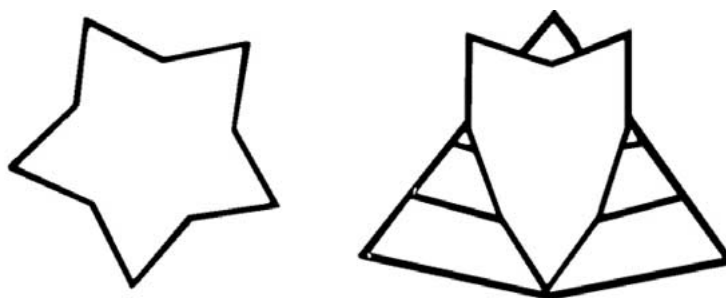


Figure 4.

3. VARIOUS KINDS OF MASKING

Kanizsa (1982, 1991) distinguishes many ways to obtain the masking of a configuration. Consider Figure 5 where, as we can see, a square made of points (a) is still visible in a set of few points (b) but is masked in a set of many points (c).

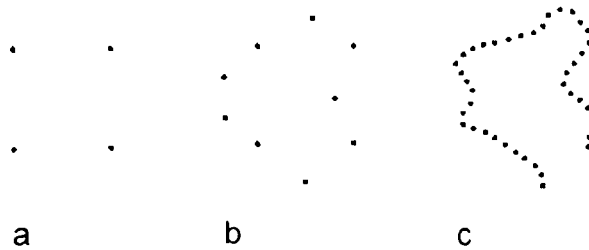


Figure 5.

I myself (Vicario 1982) have made the same observation (see Figure 6). When looking at **b**, we cannot say which points correspond to the points of the set **a**.

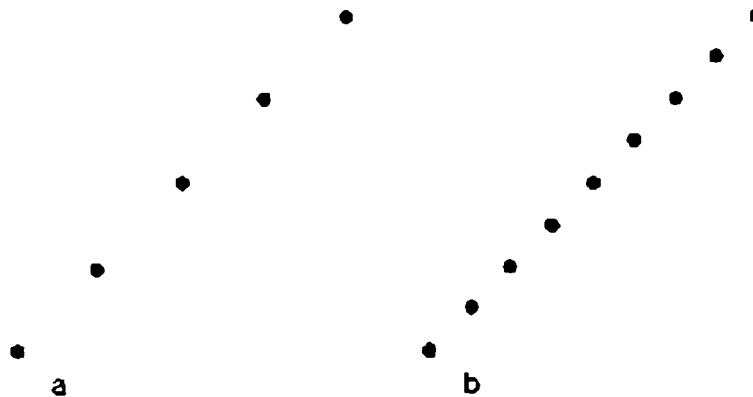


Figure 6.

I also pointed out that something similar happens in the tonal field (see Figure 7): in a sense, we could say that the *arpeggio* on the left is “masked” in the scale on the right.

Kanizsa (1982, 1991) identifies another sort of masking in reduction to the state of texture. He begins with some variations on the Galli and Zama illusion (1931). As one can see in Figure 8, the base of the triangle **A** is clearly visible in **B**, rather indistinct in **C** and invisible in **D**.

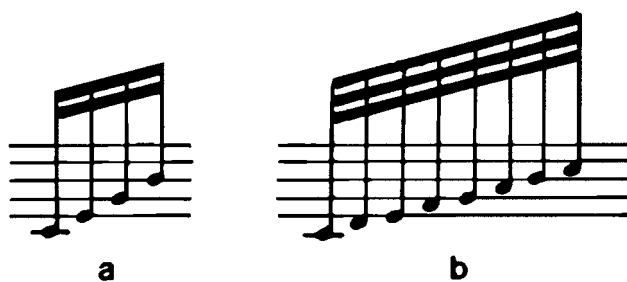


Figure 7.

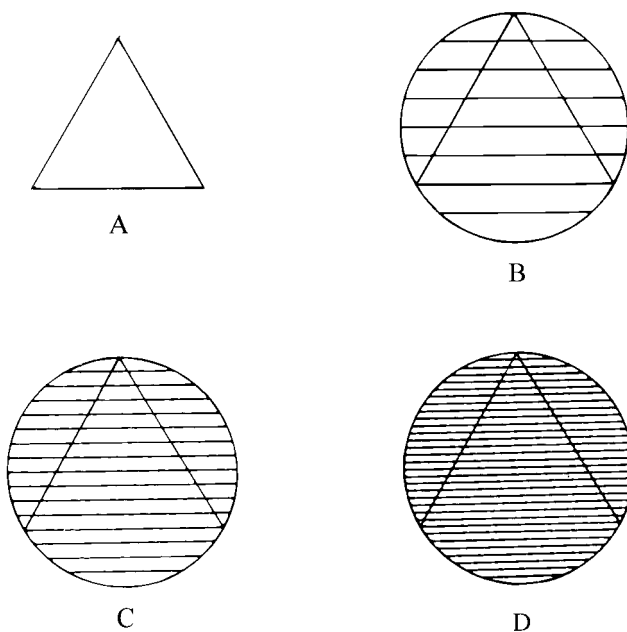


Figure 8.

Kanizsa (1982) thus theorized that masking may be a process which proceeds from elements to texture. Consider Figure 9, where the central line is clearly visible in **A** and **B**, but is not identifiable in **C**.

Kanizsa asks whether there may not also be masking by subtraction. He refers, for example, to two figures by Street (1931), the one judged “easy” (a sitting dog) and the other judged “difficult” (horse and rider). See Figure 10.

Among objects whose recognition is extremely difficult, Kanizsa (1982) reports an example devised by Porter (1954): the portrait of a *barbudo*. See Figure 11.

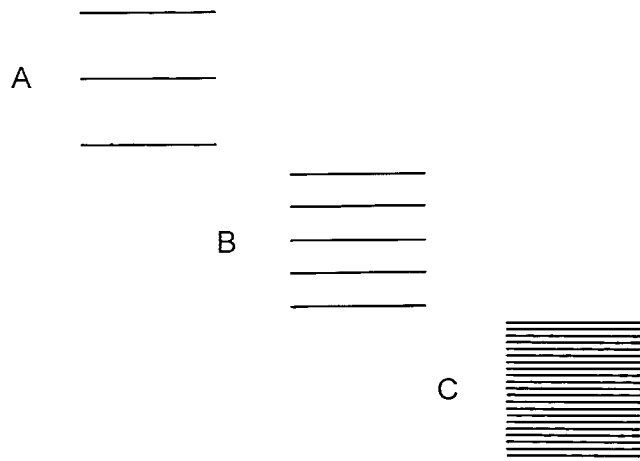


Figure 9.

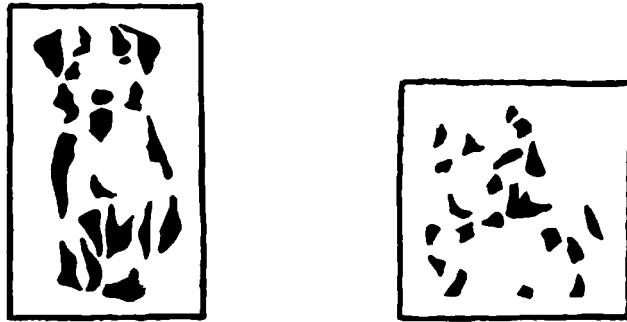


Figure 10.



Figure 11.

There is a further way – and possibly not the last - to obtain the phenomenon of masking: mirroring.

Wertheimer (1923) noted that well-known objects can disappear from sight by virtue of principles of organization. Figure 12 shows that structures of which we have much experience – the capital letters **M** and **W** (Max Wertheimer, of course) – become invisible when they are vertically mirrored.

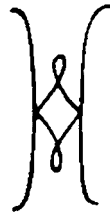


Abb. 47.

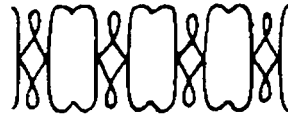


Abb. 48.

Figure 12.

Metzger (1975) propounded his own example (Figure 13), where the words **NATUR UND VOLK** are concealed by the symmetric structure of the whole.



Figure 13.

Kanizsa improved on the example in successive stages (1968a, b, 1969, 1970, 1972, 1982), until its last formulation (1991) given in Figure 14.



Figure 14.

At first glance, the two drawings in Figure 14 look like two fishbones, but when carefully inspected, they reveal that the upper part is constituted by two words: “*minimi numi*” (“the smallest deities”), and that their lower part is nothing but the mirrored image of the upper part.

In all the examples in Figures 12–14, masking is attributed to the strength of the organizational principle of *closure*: the formation of closed

surfaces first prevents one from seeing lines as objects, and then from reading the words printed in a thread-like way.

4. MASKING AND AMODAL COMPLETION

Kanizsa (1968a, b, 1969, 1970, 1972, 1982) has been the most acute investigator of the phenomenon of amodal completion since its recognition by Michotte and Burke (1951) and the first studies by Michotte et al. (1963). He posed the problem of whether the amodal completion of objects partially hidden behind others can be treated as an instance of masking. In Figure 15, one sees on the right that when four white surfaces are drawn suitably close to the irregular black cross on the left, the perceptual outcome is a black rectangle partially hidden by four objects.

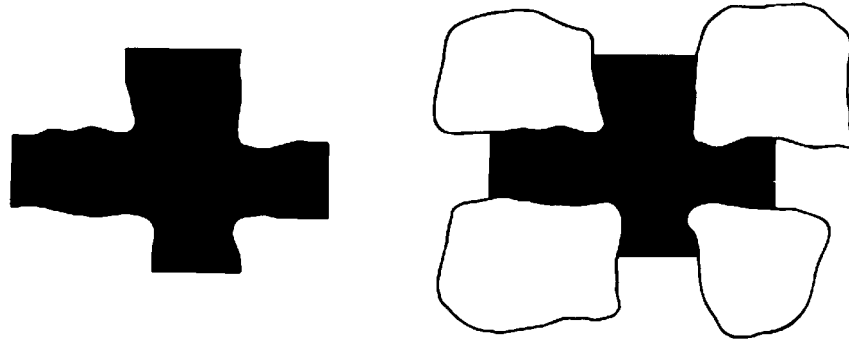


Figure 15.

I also examined (Vicario 1982b) the link between masking and amodal presence, but starting from the screen effect that emerges from a variation of Figure 9. As shown by Figure 16, if the lines in a column are fairly widely spaced, it is easy to see the continuity of the central longer line. By contrast, if the lines are thickly spaced, the longer line appears to pass behind the column. This is the so-called *screen effect* (Michotte and Burke 1951) that allows the amodal completion of the line. The drawings on the right represent what we see: above, the line passes through two columns of lines; below, the long line passes behind a simple column of lines.

It is evident (Vicario 1982) that the “masking” of the long line, and the consequent screen effect, depend on the number of lines that form the column, and on the ratio between the length of the lines of the column and the length of the longer line. Consult Figure 17: being equal the ratio (A) the number is effective (B); being equal the number (C) the ratio is effective (D).

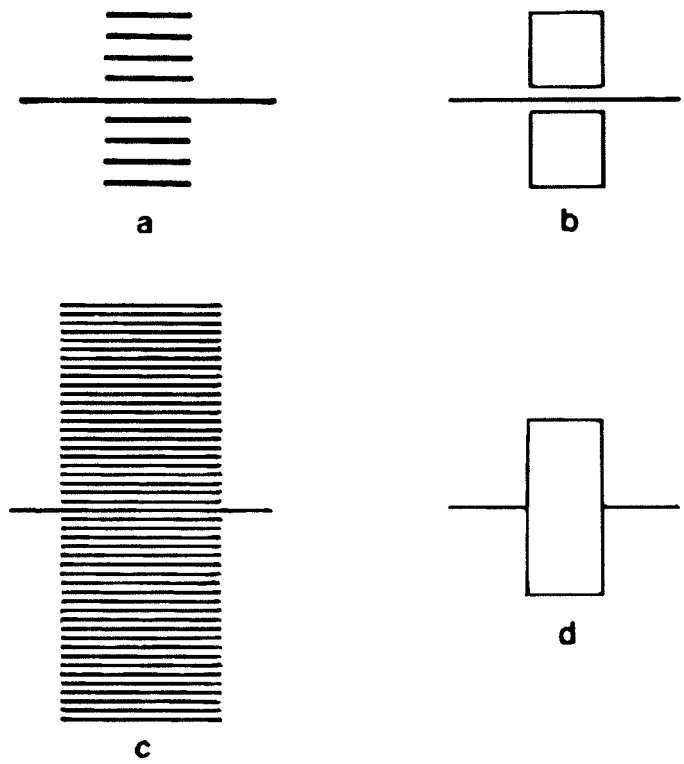


Figure 16.



Figure 17.

Bazzeo et al. (1984) devised an experiment to investigate whether the inability to see the central line clearly (that is, masking) is linked with the impression that the central line passes behind the column of shorter lines (that is, amodal completion). Statistical analysis of the results showed that cases of amodal completion are significantly related to the loss of visibility of the central line. However, the cases of amodal completion (B) are only a subset of the cases of masking (A). Figure 18 represents the situation.

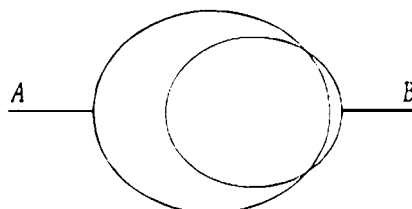


Figure 18.

5. MASKING AND FIGURE/GROUND PHENOMENON

Some aspects of the figure/ground phenomenon have been classified as instances of masking. See, for example, the following Figure 19 (Pastore 1971).

The task is to find five human profiles, obviously concealed in the borders between the black and the white surfaces (in the centre we have a Rubin's display *ante litteram*).

Kanizsa (1991) thought that some insight into the problem of masking could be gained from manipulation of the figure/ground phenomenon. He devised other figures to illustrate the matter. For instance, the following Figure 20.

The display on the left can be seen in two ways: either as five white discs on a striped ground, or as four striped arrows (see one of them at right) on a white ground. Kanizsa asked whether we can speak of "masking" when the achievement of one of the two possibilities cancels the other.

More interesting is Figure 21, where the perceptual outcome is less ambiguous.

On the left we see two human silhouettes on a blank ground. Unlike the previous figure, it is nearly impossible to see the surface between the two silhouettes as an object, which should have the form depicted at right.

Kanizsa argues that in this case the two silhouettes do not mask anything because the ground has no form. Better, it has a too irregular form,



Figure 19.

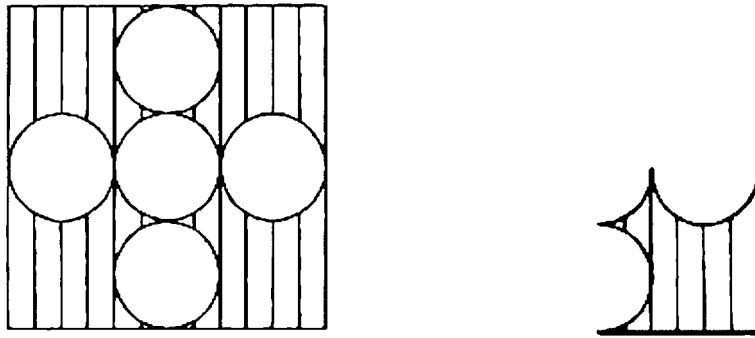


Figure 20.

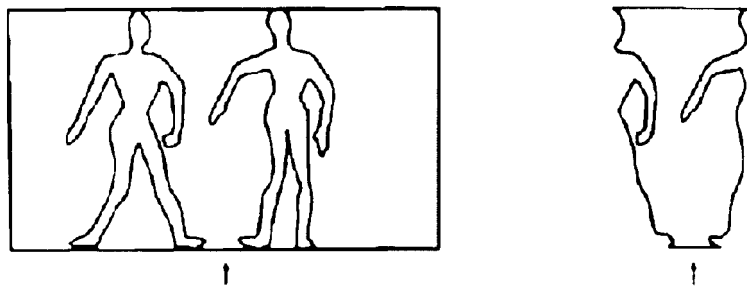


Figure 21.

which cannot be attributed to any plausible object. We may conclude that Kanizsa was inclined to think that some form of masking takes place in Figure 20 (discs and arrows), since we can build up a configuration where the figure/ground phenomenon does not lead to a difficult inversion.

In my opinion, comparison between the two figures does not clarify the question of masking. The features highlight the well-known fact that the observer has a limited ability to invert the role figure/ground of the perceived surfaces. That ability obviously has objective constraints in the set of stimuli, in the sense that articulated and complex surfaces nearly always play the role of figure, and that less articulated or less complex surfaces recede, probably because they do not constitute interesting aspects of the environment. This characteristic of the figure/ground phenomenon is reminiscent of a seesaw: sometimes the fulcrum is in the middle of the wooden board, and the resulting configurations are equi-probable; sometimes the fulcrum is nearer to one end than the other, and perceptual inversion is difficult or impossible. The question is still whether the term “masking” can be applied to the figure/ground phenomenon.

6. MASKING AND AMBIGUOUS OR REVERSIBLE FIGURES

The conclusion of the previous section becomes clear when we consider the question of whether in ambiguous figures one of the two solutions is “masking” the other.

Consider Figure 22, which is the famous display by Boring (1930) of the old/young woman.



Figure 22.

Supposing that the first thing we see is the old woman, and that only later are we able to see the young woman as well, could we say that the first is “masking” the second?

For a more recent example of ambiguity, let us consider the display by Gerbino (1982) in Figure 23.

In this ambiguous set we see, first, “bellflowers” and then “skittles”. Does the seeing of the bellflowers “mask” the seeing of the skittles? Some sort of answer can be formulated by taking into account reversible figures as well.

Let us now consider the well-known case of Necker’s cube (1832): see Figure 24 (from Vicario 2001).

At the top is the classic image of Necker’s cube. We can see it as resting on a table (a) or as adhering to the ceiling (b); and also as an empty box viewed from the right (c) or from the left (d). Can we say that the classic image, where at first glance we see only black lines, is “masking” the four

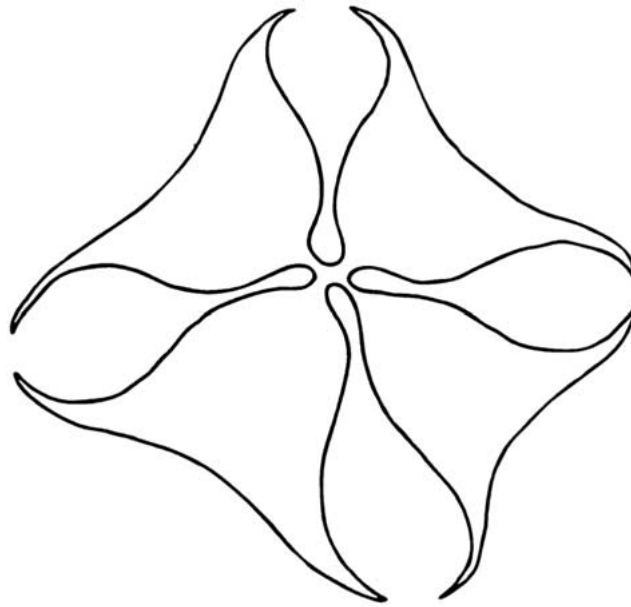


Figure 23.

solutions that we achieve when we have chosen a subjective point of view? If one can suppose that in ambiguous figures just one different solution is masked by the configuration that one actually sees, it is hard to suppose that the masked solutions are even four.

Finally, note that there is a difference between the manipulation of figure/ground aspects and the ambiguous or reversible figures when citing them in explanation of masking. In figure/ground phenomena we have two sets of stimuli, the one which builds the figure (the ground) and the other which builds the ground (the figure). In a sense, we deliberately change the meaning of the image by relying on either set of stimuli. In the case of ambiguous or reversible figures, there is only one set of stimuli, and it seems increasingly difficult to attribute the perceptual outcome to some features of that single set. This sort of argument eventually leads to the Rohrschach test.

7. MASKING AND MIMICRY

Gestalt psychologists are closely interested in mimicry in the animal kingdom (see, for example, Metzger 1975). The fact that the pigmentation, pelt or plumage hide prey from the sight of predators, apparently confirms Gestalt laws as natural laws, providing indirect proof that the visual system

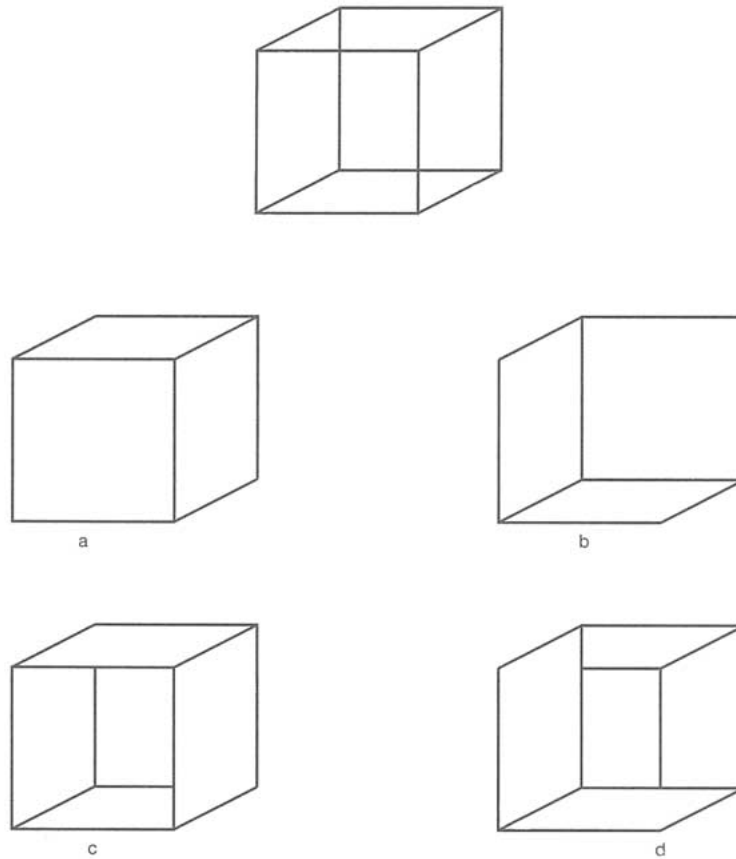


Figure 24.

in animals works in the same manner as in humans. From the countless instances of mimicry, familiar to perceptionists I will choose only the following two.

Figures 25–28 are taken from the astounding treatise by Thayer (1918): a big volume, splendidly illustrated, which Kanizsa bought on the antiquarian market. Figure 25 shows that when a zebra is standing in its customary environment made up of shrubs, it is hardly recognizable. That is because the black strips on the zebra's coat cease to pertain to an object and begin to pertain to a stronger structure formed by any thin and vertical profile. By contrary, a wooden silhouette of the zebra, when painted in an uniform way, is clearly visible.

Figure 26 shows the reason why zebras water during the night: there are no shrubs or trees around the watering hole to conceal them.



Figure 25.

According to Figure 27, the coat of a common skunk is not mimetic at all: it is white and black on the brown soil or on the green grass.

But the photograph in Figure 27 is taken from the human eye level, say 165 cm above the ground. Figure 28 shows what happens when the photograph is taken from where the eyes of a fox are, that is, about 40 cm above the ground. Surprisingly, the skunk disappears as an object because the white parts of its coat merge with the colour of the sky, and the black parts merge with the dark features of the soil.



Figure 26.



Figure 27.

In short, it seems that mimicry in the animal kingdom works in the same manner as we observe in human perception (see Metzger 1975, p. 642). The zebra in Figure 25 and the skunk in Figure 28 cease to exist for the predator as Gottschaldt's parallelepiped ceases to exist when embedded in the lattice (Figure 2), or as Köhler's digit 4 when its parts are used to build the two closed lateral forms (Figure 3).



Figure 28.

8. MASKING AND CAMOUFLAGE

As well as animal mimicry we may also consider camouflage, especially in its military version. Gerbino (1982) points out that is sufficient to paint a car here and there with the colour of the sky, to make it invisible as such.

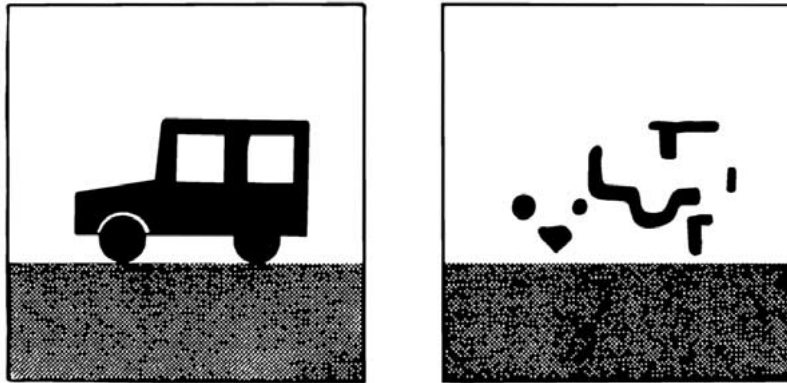


Figure 29.

The phenomenon is widely utilized by the Navy to prevent sightings in open sea. Figure 30 shows the camouflage of the heavy cruiser Indianapolis (USS CA 35, on 1 May 1944, see Cracknell 1973). It seems that painting in broad bands or sectors of different colours destroys the perceptual unity of the object, as in the case of the common skunk (Figure 28).

Thayer's treatise on mimicry provided an example of the same sort (see Figure 31) regarding butterflies.

When Figure 31 is gradually moved away from the observer – which was the manoeuvre that Kanizsa actually performed in front of me – the first butterfly to disappear from sight is, unexpectedly, the one striped in black and white; the one that seems more gaudy and therefore more visible.

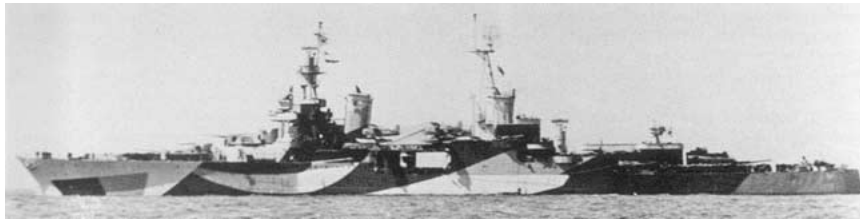


Figure 30.

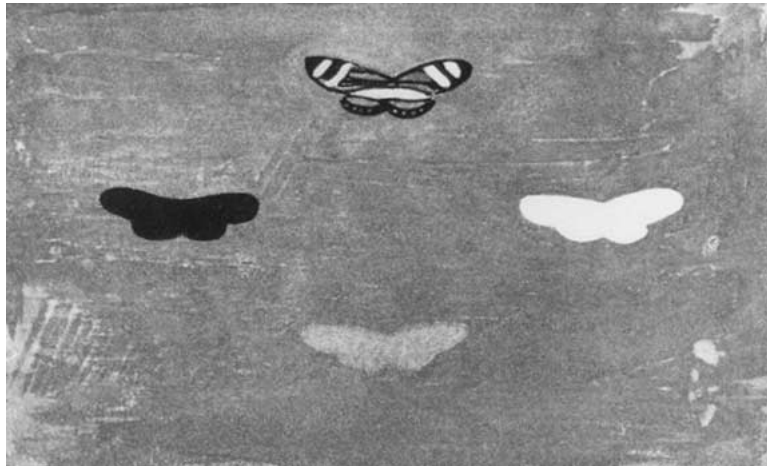


Figure 31.

9. MASKING AND COMPLEXITY

A figure of especial interest is that devised by Minsky, Seymour and Papert (1975), and reported by Julesz (1975) and Gerbino (1982), which concerns the complexity of the display: see Figure 32.

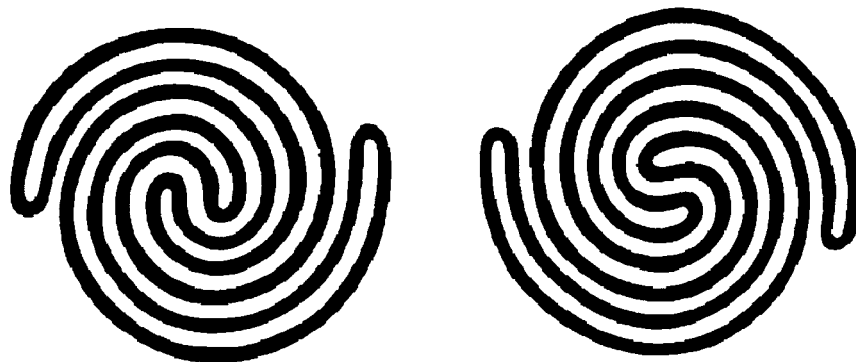


Figure 32.

The two spirals look quite alike, but they are in fact different. The one on the left consists of a single, topologically connected region (one worm); the one on the right is made up of two topologically unconnected regions (two worms).

Figure 32 stands on the border of the phenomenon of masking. Here the point is that the structure of each spiral masks not another object (as in the majority of reported examples, in mimicry, in camouflage, in ambiguous figures, or in the same object as perceivable from another point of view) but a characteristic of the spiral itself (being made up of one or two surfaces). In my opinion, what we have here is not a case of masking but of something like an optical-geometrical illusion. For instance, consider Figure 33, which reproduces Fraser's illusion (1908).

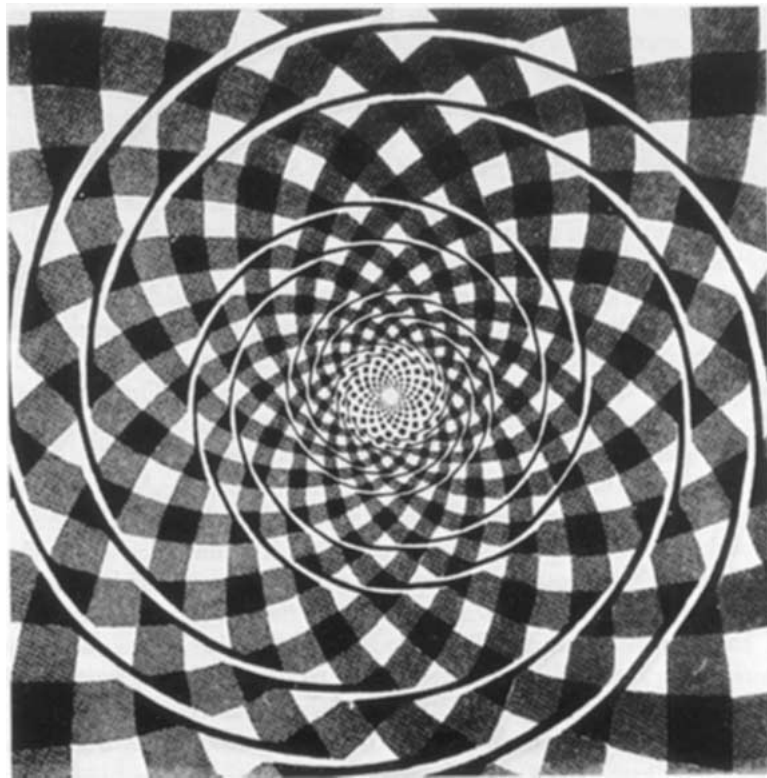


Figure 33.

Fraser's illusion consists in the fact that we see a spiral, even though the display does not contain any spiral at all. The drawing consists of concentric circles; a fact that can be tested by tracing any whatever circumference of the display with a pencil. I am therefore dubious about classifying the

fact that the figure conceals its “concentricity” as “masking”. If this were the case, we could even assert that Zöllner’s illusion “masks” the actual parallelism of the vertical long lines.

Let us now look at Figure 34, which is taken from the above cited paper by Julesz (1975).



Figure 34.

On the left, the figure shows a surface filled with **R**s rotated to various extents. Although the overall structure seems to be quite homogeneous, this is actually not the case: as one can see on the right, there is a square inside the structure where the **R**s are mirror images of the normal **R**. One may speak of simultaneous masking with regard to this substructure, because the right **R**s are 147 in number and the mirrored **R**s only 49. More properly, Julesz tells us that the phenomenon is not a matter of immediate perception – nor *a fortiori* a case of masking – but the result of a multistage analysis of the retinal image. It seems that in this case the visual system cannot handle the complexity of the optical stimulation, and therefore gives us a default picture of the external world.

10. MASKING IN THE AUDITORY FIELD

As in the visual field, so in the auditory one the term “masking” refers to basic sensory processes. As a rule, we say that a sound or a noise is masked when we cannot perceive it because another sound or noise – louder or pitched at specific frequencies – is superimposed on it. But “masking” is used here in the sense given to the term by Wertheimer and Gottschaldt: we cannot perceive an auditory object (event) when it is embedded in another object (event) provided with a stronger structure. I have made some interesting observations in this regard (Vicario 1980, 1982).

Take for example the stimulus situation illustrated in Figure 35.

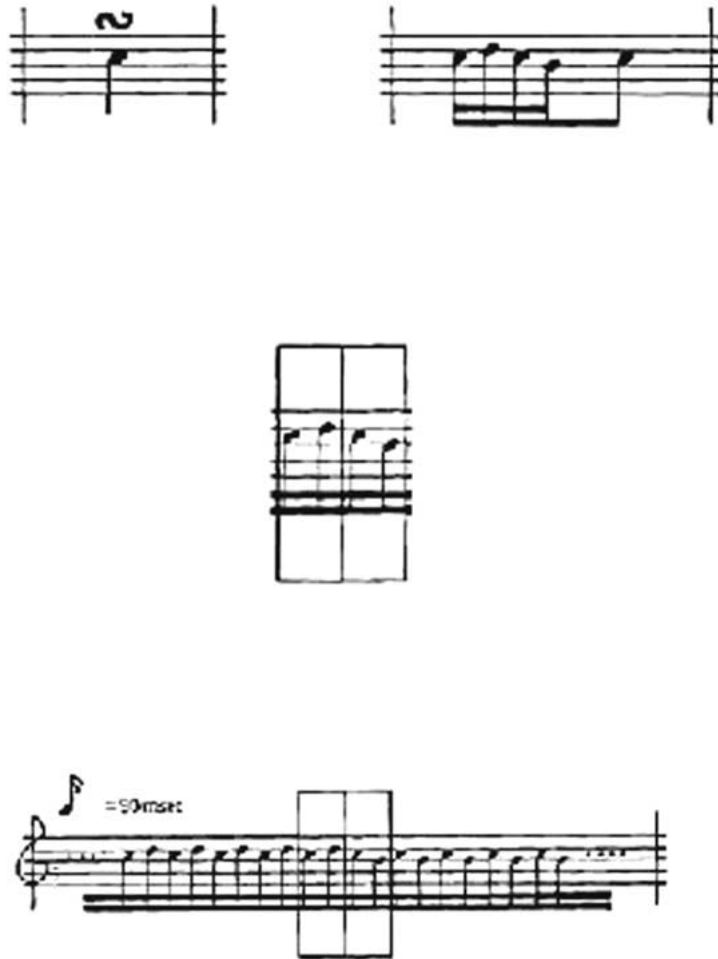


Figure 35.

At top left is the notation of a very peculiar tonal structure, namely the musical embellishment *gruppetto*. When this is executed – see top right above – especially at high speed, its snake-like gait is easily recognized. In the middle of the figure is a sort of 'analysis' of the tones that constitute the *gruppetto*: they can be grouped in two parts: the first made up of two ascending tones, and the second of two descending tones.

Now, let us add to the left wing many other couples of tones of the same ascending type, and to the right wing other couples of the same descending type – see the score below. If the succession is sufficiently fast (say, 60 msec for each tone), the *gruppetto* will be not audible: all we will hear is

two *trilli* succeeding one another, the first formed by the repetition of the left wing of the *gruppetto*, and the second by the repetition of the right wing.

We could conclude that the rules of masking in the visual field – in Wertheimer and Gottschaldt's sense – are also valid in the auditory field: some structures with parts are not perceived when their parts become parts of another, stronger structure.

I have tried to replicate the case of the *gruppetto* in the domain of speech: see Figure 36. Let us consider the two Italian nouns **RIVE** (banks) and **RITO** (rite). When they are joined together, they form the adjective **RIVERITO** (honoured). We can articulate the word RIVE many times in fast succession, and then abruptly change the utterance with another fast succession of the word RITO.

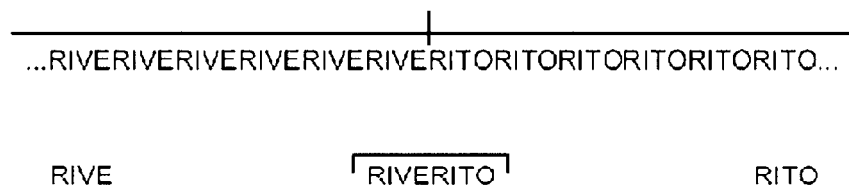


Figure 36.

I would point out that I conducted only observations, and not true experiments. Yet it was difficult for listeners, after they had heard the whole long succession, to realize that in between the words RIVE and the words RITO was also the word RIVERITO. Or at least, they did not mention its presence.

In my opinion, it is plain that the auditory field, which is made up of events, is not perfectly akin to the visual field, which is mostly made up of objects. In the latter, the situation of the observers unable to find a figure embedded in another figure by repeatedly inspecting it and with the constant opportunity to retrace their steps, is markedly different from the situation of the listeners. These latter cannot inspect their percept again, and have to rely on a memory trace that may be distinct at its ends (where there is only RIVE or only RITO), but is indistinct in the middle (where there is also RIVERITO). The matter should be investigated more deeply.

However, the comparison between masking in the visual field and in the auditory field seems to hold in regard to general premises. The outcome of a perceptual process – that is, what we see or what we hear – is the result of conflicting properties of the parts which constitute the organization as a whole. We can sometimes manipulate these properties in order to make

one part or another prominent: we may call the salient part *perceived*, and the receding one *masked*.

11. TWO TENTATIVE CATEGORIZATIONS OF INSTANCES OF MASKING IN THE VISUAL FIELD

On surveying all the displays of so-called masking, and setting aside all the theoretical problems at their bases, in my paper of 1982 I endeavoured to reduce countless phenomena at issue to a small set of categories by means of the following Figure 37. As a tribute to Köhler (see Figure 3), I chose the digit 4 as the object, and showed three ways in which it can be masked: by *disruption* (a), by *embedding* (b) and by *iteration* (c).

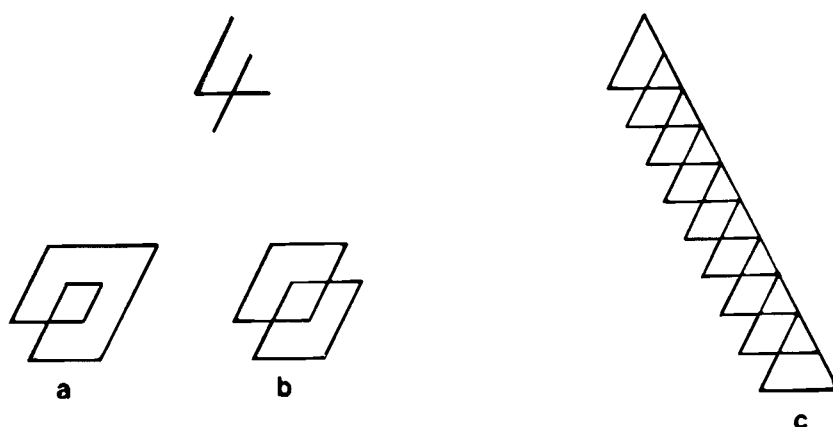
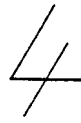


Figure 37.

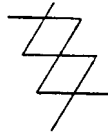
Incidentally, Kanizsa (1982) improved configuration (c) and placed it among instances of *tessellation* (see Figure 38). It is also apparent that Kanizsa relied very much on progressive “reduction to the state of texture” in explaining the degree of masking induced by the larger or stronger structure.

I was interested not only in categorization of the ways in which masking can be obtained, but also in the strength of masking itself. According to this criterion, I sought to classify instances of masking in three classes:

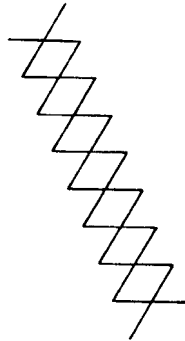
- I. *irretrievable*: see Figures 42, 43 and 44 below; once the figure has been masked, no successful effort can be made to capture it again.
- II. *coming and going* situations, which comprise the majority of classic instances of masking: see Figures 1, 2 and 3. Initially it is impossible to see any masking, then the observer discovers that another figure



A



B



C

Figure 38.

can be seen in the display, then returns to the first impression, *und so weiter*, as in ambiguous figures.

- III. *irreversible*: see Figures 12, 13 and 14. You are puzzled till you discover the trick; but when the trick is discovered, you are unable to return to the prior masking. This no-return feature is not exclusive to mirrored patterns but is also shared by displays in which the figure/ground relation is manipulated. For instance, in Figure 18 (five profiles to be found), once the profiles have been identified, it is impossible to avoid seeing them at every glance.

12. WHAT SORT OF REALITY IS THAT OF MASKED PROPERTIES?

I wish at this point to put forward some considerations that seem to have little to do with masking, and yet have had – at least for me – great importance in aiding understanding of the phenomenon.

I have made numerous observations of reversed moving pictures (Vicario 1984), both “real” and experimental. The aim was to ascertain whether expressive movements are still expressive in their reversed versions, and to what extent. I proceeded for quite some time before I realized that a reversed sequence of stimuli is not a reversed one, but *another* sequence. It is impossible to “reverse” time: it goes inexorably forward, for both original and “reversed” moving pictures.

I illustrate this point with an example from the auditory domain. Consider the melody in Figure 39.

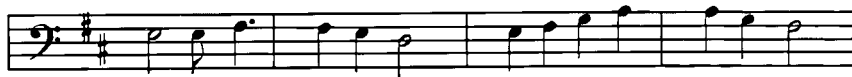


Figure 39.

This is a simple melody that one can hear, solmizate, sing, appreciate in its tonal or expressive content, performs on an instrument. Now look at Figure 40, where another melody is displayed.



Figure 40.

A glance suffices to recognize the “Hymn to Joy” from Beethoven’s Ninth Symphony. Well, this is the same melody as in Figure 38, but rewritten from the last note to the first. The claimed “reversion in time” did not produce the Hymn to Joy back to front – better “after before” – but *another* melody. We can accept the fact that the reverse of the Hymn to Joy produces another melody – the musicality of which could be questioned – but we must also accept that when there is the first, there is not the second. When we perceive one of the two tonal events, the other *has no perceptual reality*.

In my opinion, the problem of masking is of the same sort. When we have a set of stimuli, we perceive a visual configuration. By manipulating the stimuli (adding up, subtracting, changing) or by forcing attentive processes, we are able to see other configurations. The former configuration

is not “masked” by further ones: after the manipulation of stimuli or of attention it simply *does not exist*. From a perceptual point of view, things exist only when we see them.

13. MASKED IS ONLY WHAT CAN BE UNMASKED

We come now to the *punctum dolens* of the entire discussion, namely the starting point of the papers by Kanizsa and myself.

In his course of lectures, Kanizsa (1982, 1991) was wont to introduce the difference between seeing and thinking by using the display shown in Figure 41. Display A is obtained by superposing the white sheet of paper B, with suitable holes, to the black cardboard C.

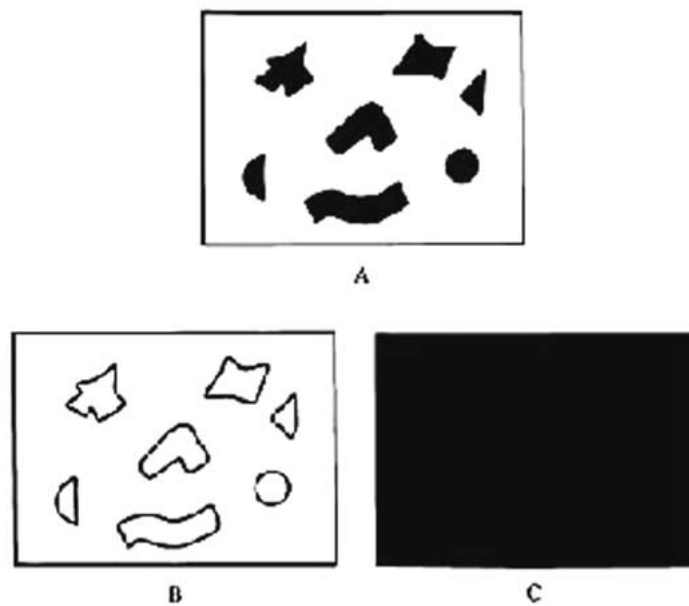


Figure 41.

Kanizsa asked his students to describe what they were seeing, and they unanimously said “black figures on a white ground”. At this point Kanizsa raised the white sheet with holes and asked them whether they could see the figures on the homogeneous black surface. They declared themselves unable to do so, and Kanizsa concluded by pointing out that in a sense the figures were still there – the relative distal stimuli did not vanish – and that one could *imagine* the figures in their places but could not *see* them. He sometimes added that figures could be “masked” in the homogeneous

surface in Michelangelo's sense, when he claimed that the block of marble contained the statue within itself, and that it is sufficient to remove the surplus marble to reveal the body of the statue.

The presentation was always successful, but Kanizsa was dubious about its real meaning: he felt that there was something wrong with his argument.

I called this "Kanizsa's paradox", and – as his teaching assistant – tried to improve the display by suggesting the following Figure 42 (Vicario 1982). Also in this case the dotted triangle (b) on the right is, as a figure, inside the dotted surface (a): we can imagine it, but we cannot see it. The triangle is masked in the surface.

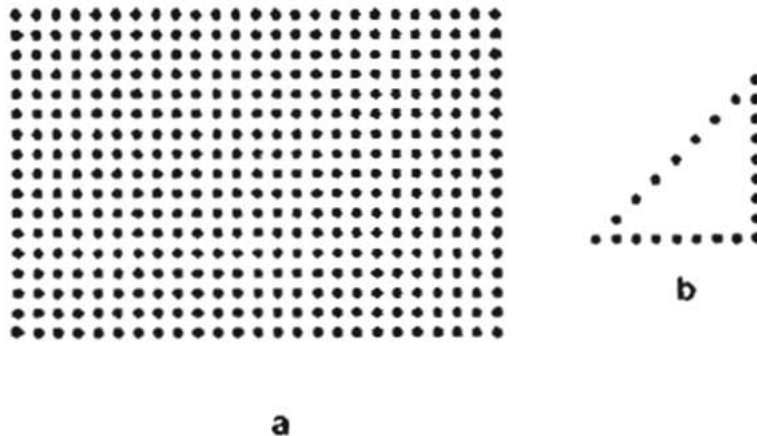


Figure 42.

Kanizsa agreed very much with my improvement, and promptly stated that his own argument was not a paradox but a sophism. It is a sophism – he explained – because in Figure 41 the "points" of which the masked figures are held to be made of are not *phenomenal* points but physical ones: a remarkable *stimulus error*. Figure 42 avoids the error and clears the way for a new insight.

For instance, it seems nonsense to say that a capital letter **F** is "embedded" or "masked" in a capital letter **E** (Vicario 1982, see Figure 43).



Figure 43.

Kanizsa (1982) proposed the following Figure 44, stating that we cannot say that the word **cocco** (cocoanut) is masked or embedded in the five circles.



Figure 44.

I suppose that it was these examples, together with the many questions posed in the conditions of figure/ground relation, of ambiguous figures and of amodal completion, that induced Kanizsa to conclude that *it can be masked only what can be unmasked*. He credited me with discovering the criterion with which to distinguish masking from other phenomena, and I must admit that it was the first and only time that my master took notice of an opinion of mine – after all, in his own field of research. In fact, it was my Figure 42 that made him to condense the problem and solution of simultaneous masking in visual field in a short sentence.

Kanizsa continued to think that masking was a true perceptual phenomenon, despite the many objections that I raised at that time, and which I renew now. In my 1982 paper, as well as in the conclusions of the paper on the link between masking and amodal completion (Bazzeo et al. 1984), I maintained that such a perceptual phenomenon as masking does not exist: adding or subtracting parts, modifying surfaces, painting parts with different colours and so on, simply signifies that we change the stimulus, and that it is no surprise that we see things other than those expected.

14. GERBINO ON MASKING

My position on the problem has been expressed more lucidly – and independently, it should to be noted – by Gerbino (1984b). These are his points.

- I. There is a psychophysical meaning of the term “masking”: in this acceptance, masking makes no sense. Addition or subtraction in the distal stimulus simply alters the information given by it.
- II. There is a procedural meaning of the term “masking”: this refers to hypothetical processes taking place in the brain between proximal stimulus and perceptual fact. Also in this case the term “masking” is misleading: we cannot believe that the ideal cycloids in which we resolve the rolling of a wheel are actual processes.

(Gerbino refers to a famous study by Rubin (1927), which I know Metzger's treatment (1975): see Figure 45. A: the projection on the retina of the movement of a point on the circumference of a rolling wheel is a cycloid; B: cycloids generated by all the points of the circumference of the wheel during the rolling; C: the two sole movements perceived, that is the rotation of the wheel and the translation of the centre of the wheel.)

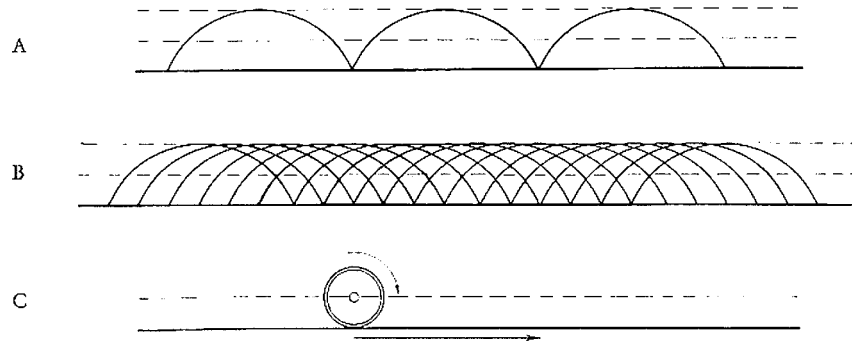


Figure 45.

The Gerbino's point is plain: since we do not have perception (consciousness) of all the processes that inside the brain lead to some perception, we cannot say that the final step of these processes – that is, what we actually see – is “masking” those processes themselves.

III. At the phenomenological level, “masking” refers to a heap of facts that have little or nothing in common.

15. CONCLUDING REMARKS

I agree with Gerbino on points I and II: every criticism that I have set forth in my review demonstrates them. The concept of simultaneous masking in the visual field undoubtedly looks like an oversight. On the contrary, I disagree with point III: all the phenomena that I have mentioned *must* have something in common if we label them with the same term “masking”.

In my opinion, the criterion “masked is only what can be unmasked”, if valid, refers to a situation of comparison between what we perceived on a first occasion and what we perceived on a second one. In all the instances of masking reported here, there is something that we see at first glance, and another thing that we see when inspecting the display more carefully, or arranging the parts in accordance with another subjective setting, or by means of attentive acts. The proof is in instances of irretrievable masking

(Figures 41–44): Kanizsa, Gerbino and I agree that in such instances there is no masking at all, because nothing more springs off from the display: we can inspect it as long as we want, but what we see is only a black surface, a dotted surface, a capital E or black circles.

In the cases of true masking, the act of comparison is accompanied by a feeling of surprise: we take note, with more or less surprise, that something else can be perceived in the display, although the stimulus situation is still the same. That clearly happens with ambiguous and reversible figures, but also with the classic instances given by the literature (Figures 1–4 and many others) To be added is that when we do not feel surprise, then a masking effect has not occurred at all: in Figure 24 we realize that the scarcity of shrubs does not efficiently mask the actual zebra – at least for a human observer.

I see a similarity between the feeling of surprise in the unmasking act and the *Aha Erlebnis*, that is, the feeling of having found the solution to a problem with an act of *insight* (Wertheimer 1945, Duncker 1945). For instance, consider Figure 46: it shows four trapezoids that at first glance have nothing in common.

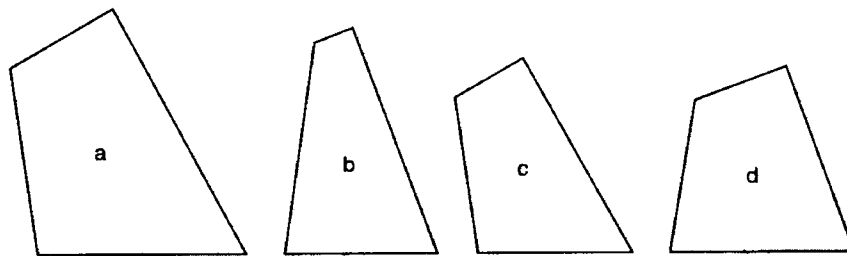


Figure 46.

The experimenter asserts that they have something in common, and asks the subject to find it. The search may take a long time, but at a certain point the subject says: “That!”, and arranges the four trapezoids in the manner of Figure 47, where they appear to be the parts of a square.

One point to emphasize is that the solution comes suddenly, as we suddenly become aware that an object is “masked” in a certain pattern. Another point is the feeling of surprise, which is the same as in masking instances. As we know, the solution of the problem is attributed to reorganization of the perceptual or/and cognitive field. (See also Kanizsa 1975, where the perceptual obstacles to reorganization of the field are investigated.)

To conclude, the fact that the masking phenomenon cannot take place without comparison between two perceptual acts (better, between a per-

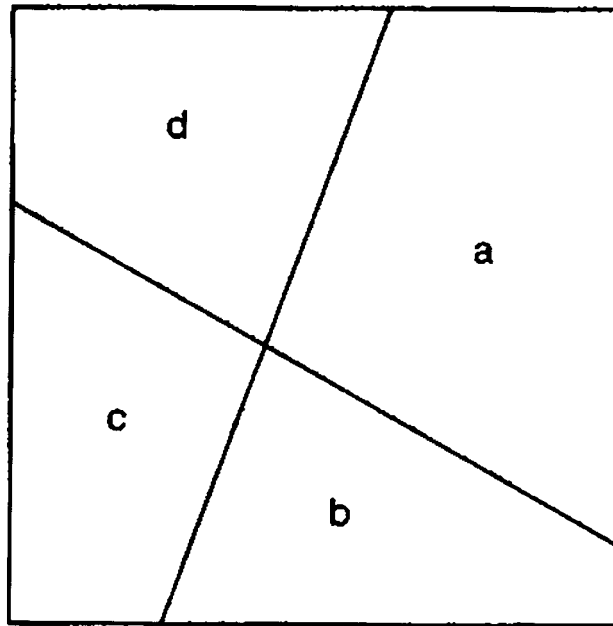


Figure 47.

ceptual act and the memory trace of a previous perceptual act), and the hypothesis that the reorganization of the perceptual/cognitive field is something more than the straightforward taking note of a stimulus, lead me to assert that masking is not a bare perceptual phenomenon, but a psychological process –which as usual, warrants further investigation.

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