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Introduction to Baingio Pinna´s "New Gestalt Principles of Perceptual Organization: An Extension from Grouping to Shape and Meaning."

The late Walter Ehrenstein, to whom this article is dedicated, called Baingio Pinna an heir to Gaetano Kanisza for his many well-known phenomena and unparalleled creativity, productivity, and imagination. In the article, to be reviewed here, Pinna presents new, fascinating examples of global-local (Figs. 1, 15, 18) and local – global interactions (2 - 6, 8, 11, 13, 14), apparent rotation (16), long-range assimilation (17), apparent causality (19), perceptual meaning (20 - 23) and even visual language and sentence structure. To express the contents of his article in one's own words is not an easy task.

We have come to expect that most of Pinna's demonstrations are self-evident and sufficiently compelling to justify his descriptions. This is also the case here. (Exceptions are Figs. 7, 9, 10, and 12.) To further support the empirical validity of these observations, he provides percentages, obtained from magnitude estimation, showing how many in his independent samples of 10 subjects each agreed to a certain response (usually above 85%). The exquisite description of those observations is remarkable.

The paper starts out (p. 12) by positing three kinds of perceptual organizations (forms): grouping/figure-ground segregation, shape, and meaning. For clarification: "Form" is used as a term for perceptual organization and must not be confused with "shape". Furthermore, "grouping" refers to elements, such as small squares, within an array of other such elements. "Figure-ground segregation" finally refers to perceptual organization of elements, differing in some aspect within such arrays and having a certain shape.

The paper begins by asking (verbatim from p. 12): "Are the forms of shape and meaning independent from the one of grouping/figure-ground segregation? How are the problems of grouping, shape and meaning mutually related? Can the forms of shape and meaning be considered as part of a perceptual organization process? What is perceptual meaning? What are the main phenomenal rules governing the formation of shape and meaning?"

Pinna wants us to understand (continued from p. 12) that "The answers to these questions aim primarily (i) to suggest a link between perceptual grouping, shape

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perception and visual meaning, (ii) to trace the visual shapes and meanings back to organizational processes similar to grouping, thus following the same phenomenological and epistemological basis inspired by Gestalt psychologists but, at the same time, going beyond the principles studied by them, (iii) to define the phenomenal underlying structure and principles ruling the formation of shapes and meanings, and, finally, (iv) to delineate a new theory of perceptual organization based on this interrelated [threefold] partition of forms." This is a bold program and a bold undertaking.

In the interest of an unbiased description, I am confining myself to the observational facts and to characterizing these observations largely without recourse to Gestalt terminology and connotations. For example, global or overall stands for "whole" and local for "parts".

Fig. 1. Rectangle Illusion. The small squares in an 8 x 8 array are not only perceptually grouped according to their color (black or white), but also look slightly longer in the horizontal direction when arranged in rows and longer in the vertical direction when arranged in columns. This suggests an effect of global organization onto the shape of the local percept (small squares). Pinna states that the 8x8 array shows the same perceptual elongations as the small elements. He reasons (p. 16) that "grouping and shape formation can be considered as two complementary integrated processes of perceptual organization."

Fig. 2. A Six-Pointed Star is used to demonstrate the role of the inner structure for the appearance of the global percept. A solid black surface, an indented rectangle with two lateral spikes, two overlapping triangles (similar to the star of David), and an empty outline are shown. Pinna attributes these percepts to the Gestalt factor of symmetry and the principle of *Praegnanz* and discusses the different definitions of this principle. Given that the circumference of the star-shaped figure is constant, it does not necessarily follow that a change of its *Binnenstruktur* produces a change of the overall percept. The various shapes mentioned above are thus emergent properties.

Fig. 3. A Distorted Seven-Pointed Star is similarly shown in various versions, yet the deviation from regular symmetry is hardly noticed in the resulting heptagons, with the exception of Fig. 3c, which looks perceptually distorted (like an impossible figure) and unstable. Pinna states that in these figures the Gestalt factor of good continuation is pitted against the Gestalt factor of symmetry, with the latter one "winning" against the principle of *Praegnanz*. It is not clear why this demonstration is called an illusion.

Fig. 4. Grouping Diamond Illusion. This figure demonstrates that grouping of the elements determines the perceived shape of the overall pattern. A large diamond is perceived when the small diamonds from which it is composed are arranged diagonally to the sides (a), whereas a large tilted square is perceived

when the same small elements are arranged in parallel to the sides (c). This is remarkable as the orientation of both patterns is identical. The same perceptual difference also occurs when the small elements are squares instead of diamonds (g and h), but does not occur, when the overall figure is composed of small diamonds and resting on its side. Here internal grouping according to color yields the same overall percept: a large square. Both kinds of stimuli should yield distinctly different brain signatures, when used as tests in functional magnetic resonance imaging (fMRI).

Fig. 5. Illusion of the Scalene Triangle. Small white and black isosceles triangles form a large triangle that either looks isosceles (two sides equal, patterns a and b) or scalene (all sides different, pattern c). The perceived symmetry or asymmetry depends on the orientation of the grouped elements within the large triangle. This again is an example of the effect of the elements onto the perceived overall shape. Notwithstanding the different appearance, all three triangles are seen to point towards the sharp tip, regardless of the arrangement of the small triangles. Question: Will there also be a difference in perceived shape, when the three triangles are shown base-down instead of in different orientations?

Fig. 6. The Beveling Effect. The same triangles as in the previous figure are presented with one of the vertices between the two unequal sides missing. This manipulation changes both the perceived shape of the triangles (to scalene) and the direction of pointing. As before, manipulation of the elements affects the appearance of the overall pattern. Again, here I would like to see all three triangles (a – c) oriented equally, base-down.

Fig. 8. The Concave-Convex Illusion. This is a strong illusion, showing that the local tilt of the white bar in each black square affects the perceived global orientation of the grouped squares. To further study this effect, one would like to see the black squares presented without the white bars; and alternatively, the white bars presented on a uniform black background. The illusion is reminiscent of the rendition of the Fraser and Zoellner illusions by Tyler and Nakayama (1984) using striped letters.

Fig. 11. The Trapezoidal Illusion. Here, Pinna shows the condition asked for in Fig. 8. Clearly, the orientation of the individual small outline squares has an effect on the perceived orientation of the larger grouped squares.

Fig. 13. The Inverted Rod and Frame Illusions. Whether an outline square is perceived as a diamond (a) or tilted square (b) depends on the orientation of the narrow inset rectangle. This effect is related to the Grouping Diamond Illusion (Fig. 4). So is the perceived difference of the small white quadrangle in patterns (e) and (f). Both are effects of local orientation and grouping on the global appearance of the overall stimulus pattern.

Fig. 14. The Pointing Illusion. The perceived change of the direction, in which the equilateral triangle appears to point, is due to the different orientation of the narrow inset bar (b – d). Here, local orientation determines the global orientation of the overall percept similar to Figs. 13 a and b. A similar bias is observed with a cut-off corner (e – i). See also the Beveling Effect, Fig. 6.

Fig. 15. Loss of Collinearity Illusion. In row (b), the dots appear to dance up and down depending on their position relative to the circles. This is an effect of the larger enclosure onto the enclosed small dot and suggests a dynamic tendency towards centering (symmetry, inner balance) and against good continuation. The effect depends on eye movements. With fixation, it disappears (Fischer et al, 2003).

Fig. 16. The Counter-Rotation Illusion. Vivid counter-rotation of the two rings in (b) is perceived when one approaches or recedes from the stimulus pattern. Weaker effects are observed in (a) and (c) and little if any rotation in (d) and (e). This astonishing illusion is due to a specific sequence of the dark and bright edges, partially delineating a gray square on a grey background, and is known throughout the world as the Pinna-Brelstaff illusion. Pinna attributes the illusory motion, in part, to the Gestalt factors of proximity, similarity, and common fate. The effect bears a certain resemblance to the rotating snake illusion (Kitaoka & Ashida, 2007). Different temporal latencies for different contrasts may play a role in both kinds of illusions.

Fig. 17. The Watercolor Illusion. A faint orange color is seen to spread uniformly across a large surface area when surrounded by an orange contour and flanked by a darker purple contour. This is an example of assimilative color filling-in from sparse stimuli. Undulation of the contours helps. Long-range neuronal interaction of luminance mechanisms has been invoked to account for this effect. This is the second well-known illusion by Pinna. The watercolor effect strongly promotes figure-ground segregation and in doing so overrules many of the classical Gestalt factors.

Fig. 18. The Illusion of the Perception of Absence. Here, a chunk of 2 x 2 dots is missing from an array of dots and, depending on whether it is cut out from the top or the side of the array, looks like a small diamond or a square. At the same time, the larger array of which it is a part, also assumes the shape of diamond or square. This demonstration is evidence for the mutual interaction between local and global properties. The effect is related to Figs. 13 e and f.

Fig. 19. The Illusion of Meaning. Here, Pinna enters a new field of perceptual research, the realm of dynamic cognitive perception, as known from cartoons and static representations of animated events. This is reminiscent of Wolfgang Koehler's paradigm (1933) "Maluma – Takete" and represents a giant step beyond the *Laws of Seeing* (Wertheimer, 1923; Metzger 1936/2006). By showing

24 variations of a square, he demonstrates that as many different meanings may be obtained, when one of its corners is transformed in various ways. It is worth doing a little experiment to compare one's own meanings of Figs. 19 b – x with those of Pinna's subjects, to check on the generality of their responses (p. 53 - 56). Pinna attributes these visual disturbances to some sort of extrinsic or intrinsic force and calls them "happenings", reminiscent of Albert Michotte's (1945, 1962) perceptual categories of apparent causality. Analogous to Michotte's demonstration of push/launch, shove, pick-up/entrainment, repulsion, and overtaking, he assigns them to a (primitive) language of perception that is as rich, and sometimes richer, than the spoken language. He even considers a visual sentence structure of subject, predicate, object.

On p. 56, Pinna states, "What is perceived in Figs. 19 are meanings of shapes whose components are grouped according the gestalt principles." And on p. 57, he details: "…the happening makes the figure appear incomplete and irregular and at the same time complete and regular." This distinction leads him to separate between a contingent (incomplete) and an ideal (complete) level of perceptual meaning, a distinction to be understood as an emergent property. On p. 58, he says: "The ideal and contingent levels are not perceived in the same way: the former is perceived amodally, the latter modally."

Fig. 20. The Illusion of Meaning. These are demonstrations of different kinds of 'happenings' in a checkerboard. The incomplete appearance of the overall appearance implies the dynamic fate of the tumbling checks.

Fig. 21. The Illusion of Meaning. Different kinds of deformation of a checkerboard are shown: folded, stretched, pulled, pushed, and extended. Pinna states (p. 64) that "The cause of the deformation is invisible although amodally perceivable." And he continues: "These examples suggest that the form of meaning is not only a process of meaning assignment but also a process of meaning creation." Finally: "The meanings do not necessarily have a name and are not necessarily identifiable." This is illustrated in the next figure.

Fig. 22. Other Deformations of a Checkerboard. The legend says: "Happenings and checkerboards are clearly perceived but it is extremely difficult to perceive and say what is 'happening' and what is causing that 'happening'."

Fig. 23. The Illusion of Meaning. Various causes of tumbling. Here Pinna demonstrates his credo that "Everything assumes a meaning within the context of other meanings." On p. 66, he proclaims: "Everything is put together into a meaningful way. This is a basic general principle of the form of meaning. The questions are: How does the presence of a new element influence the part-whole meaning organization? … Does the part-whole organization change its structure?" The reader who has followed my introduction up to here is invited to read chapter 5 (pp. 69 - 72), where Pinna sets out to search for the meaning behind the

meaning of visual percepts by presenting an impressive framework of propositions and definitions that may mark the starting point of a new theory of cognitive perception. The writing is too complex to be conveyed in simple sentences.

This article is a major achievement by one of today's most visible phenomenological psychologists. Yet, it makes me wonder why it is that 50 years after my introduction to Gestalt psychology, I continue to be struck by the fact that Gestalt terminology and Gestalt thinking are so difficult to understand? While a rose was a rose was a rose to Gertrude Stein, Malevich's supremacist square is a square is a square to Baingio Pinna (p. 59). For me Gestalt factors are descriptive, not explanatory. Unless we know their neurophysiological correlates, an account in terms of good continuation, symmetry, closure, proximity, similarity, and common fate, under the overarching principle of *Praegnanz*, can at best be called *consistent with* such factors, no more.

In this article, written in recognition of the 2009 Wolfgang Metzger Award, Pinna has moved from experimental to descriptive to speculative and hypothetical. He thus follows Metzger (1966) who argued that perceptual (Gestalt) laws also concern aesthetic properties and, *vice versa*, geometrical shapes convey meaning and expression. When Pinna speaks of a "deeper" meaning, he similarly suggests an impression beyond the *prima facie* evidence of a given phenomenon. I can see the influence of the philosopher Liliana Albertazzi, with whom Pinna had a joint poster in Utrecht (2008), behind this move. One is thrilled, where their collaboration may take them.

Here, Pinna provides phenomena of far-reaching significance for perceptual research and, in interpreting some of them as meaningful events, goes beyond traditional borders. Others are called upon to pick up the leads and search for the neuronal mechanisms in future studies (Spillmann, 2009).

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Karl Duncker

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Karl Duncker – 1903 in Leipzig geboren, 1935 aus dem nationalsozialistischen Deutschland in die USA emigriert, wo er 1940 aus dem Leben schied - zählt zu den bedeutendsten Vertretern der Gestaltpsychologie. Sein bekanntestes und wohl auch einflussreichstes Werk ist seine 1935 erschienene „Psychologie des produktiven Denkens" (Verlag Springer, zweite Auflage 1963), das auch der so genannten „kognitiven Revolution" in den USA und Europa wesentliche Impulse gab und bis heute die Denkpsychologie anregt.

Der vorliegende Sammelband stellt eine Reihe von Beiträgen Dunckers vor, die im deutschen Sprachraum bisher weniger bekannt geworden sind, obwohl sie alles andere als von bloß wissenschaftshistorischem Interesse sind. Der Bogen spannt sich von der Auseinandersetzung mit dem Behaviorismus über Grundfragen von Erkenntnis und Bewusstsein bis hin zur Zurückweisung des ethischen Relativismus und einer bestechenden Analyse menschlicher Emotionen und Motivation. Teils aus dem Englischen übersetzt, teils als Wiederveröffentlichung oder auch Erstercheinung lange Zeit verschollener Originalarbeiten, belegen die hier versammelten Arbeiten die ungebrochene Aktualität des überaus differenzierten Denkens, Wahrnehmens und Forschens von Karl Duncker auch für die zeitgenössische psychologische, psychotherapeutische und philosophische Diskussion und Reflexion einer Reihe von Grundfragen der menschlichen Existenz.