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Investigations on Gestalt Principles

by Max Wertheimer

with 56 illustrations in the text

101) I stand at the window and see a house, trees, sky.

For theoretical purposes, I could now try to count and say: There are ... 327 brightnesses (and color tones).

Do I "have" 327? No; I have sky, house, trees. Having the 327 as such is something no one can actually do.

If, in this droll reckoning, there happen to be 120 shades of brightness in the house and 90 in the trees and 117 in the sky, then at any rate I have that grouping, that segregation, and not, say, 127 and 100 and 100; nor 150 and 177.

I see it in this particular grouping, this particular segregation; and what nature of grouping and segregation I see is not simply a matter of my whim. I can by no means just get any other pattern of coherency I like at will.

(And what a remarkable process it is, when for once something like that visual integration succeeds in happening. What astonishment when, after looking for a long time, after considerable efforts with a very unrealistic set [*Einstellung*], I discover that there at the window, sections of the dark frame, together with a smooth branch, form a capital letter N.)

Or: I see two faces cheek to cheek. I see one of them, with, say, its theoretical "57" brightnesses, and the other, with its "49," but not partitioned into 66 plus 40 nor 6 plus 100.

Theories claiming that I see "106" exist only on paper; what I see is two faces. Yet this is only a matter of the nature of the grouping and the integration; and that, at any rate, is determined in this particular way. Only this state of affairs—modest but theoretically not unimportant—is handled here to begin with.

Or: I hear a melody of 17 tones with its accompaniment of 32 tones. I hear melody and accompaniment, not simply "49" or at least certainly not normally, nor purely at my whim, 20 plus 29.

This is also true when the stimulus is discontinuous. It is true when, for instance, the melody with its accompaniment is played on an old-fashioned music box in the form of short, individual little bell tones or, visually, in figures, Gestalten composed of discontinuous components such as dots, each separate from the others against a homogeneous background. It might be easier to achieve other types of grouping in these cases than in the previous ones; nevertheless, for the most part there is still a normally expected, "spontaneous," "natural" type of perceptual grouping and segmentation evoked. Indeed, only rarely, under particular circumstances, can something else result or, still harder, be artificially evoked via special means.

In general, if a number of stimuli are presented to a person simultaneously, generally that person does not experience an equally large number of individual *givens*, one and another and a third and so on. Rather, the person experiences *givens* of larger scope, with a particular segregation, a certain grouping, a certain division. And whatever one's theoretical interpretation might be, whether or not one travels far from the straightforward findings and assumes for theoretical purposes a basis in the sum of the "327... sensations," nevertheless there remains a straightforward factual problem:¹

Are there principles that govern the nature of the resulting perceptual grouping and division? What are they?

If stimuli *a b c d e*... are active together in a certain configuration, what are the principles whereby the typical grouping is perceived as *a b c / d e*... and not, say, *a b / c d e*...?² This question applies whether the first grouping is what regularly results and in fact a certain other cannot be achieved, or the first grouping is merely the normally expected, spontaneous, "natural" one while the second is also quite possible, but only artificially or under special circumstances, and perhaps more unstable.

Because of the present prevailing theoretical state of affairs, the following discussion starts with configurations of discontinuous stimuli.

One can seek to identify and isolate the effective factors that govern perceptual segmentation and grouping in a variety of experimental

[p. 303] arrangements.³ We will come back to several experiments at particular points in what follows, but for purposes of demonstrating the most essential factors, it would suffice to present a series of simple, specifically chosen examples. The following confines itself to selecting a few essential principles. (This will also involve consideration of certain problems that have hitherto been overlooked.)

It would be instructive to begin by imagining the principles which, according to conventional theoretical assumptions, might explain perceptual grouping. We will return to this in detail later; for now there is only one point to be emphasized:

If it were actually the case that for a certain configuration, one type of grouping is the normal one, the more "natural" interpretation, then of course this is an observation based primarily on experience. But what does a basis in experience mean, in the strict sense of the customary usage? Suppose that this grouping, for instance: *a b c* has often been presented together, without *d e f*, and likewise *d e f* in turn has often been presented together (perhaps with these two "associative complexes" also associated each with a word as well). Hence when *a b c d e f* appears, it is obvious that the grouping *a b c* and the grouping *d e f* would be expected to be perceived, rather than *a b* and *c d e f*, which had not been experienced together frequently. In the example mentioned at the beginning of this paper, the complex "house" and the complex "window" are

1. C. Stumpf says ("Erscheinungen und psychische Funktionen," Abhandlungen der Königlich Preussischen Akademie der Wissenschaften 1907, p. 24), "Through careful study of single sensory areas one will arrive at laws of grouping..." Here "the last word must rest with experimental psychology, and so far it has still hardly said its first."

2. Cf. G. E. Müller in "Gesichtspunkte und Tatsachen der psychophysischen Methodik" in "Ergebnisse der Physiologie" (Asher-Spiro) Part II, Year II, pp. 237, 238; 1904.

3. The investigations communicated in what follows originate principally in the years from 1911 to the beginning of 1914 (except for §§42 and 50). Concerning what is already available in the literature, aside from individual citations in the text, use the general references here: see the mention of the factors that arise for the "degree of coherence" in the remarks of G. E. Müller, loc. cit., p. 238; cf. the visual investigations of Schumann, Bühler, and Benussi, among others. I also refer here in general to the frequent material agreement with the beautiful investigations published meanwhile by E. Rubin ("Die visuelle Wahrnehmung von Figuren," VI Congress for Experimental Psychology 1914, p. 60; "Visuell wahrgenommene Figuren" Danish 1915, German 1921; "Psychologische Geometrie," VII Congress for experimental psychology, and "Zur Psychophysik der Geradheit," *Zeitschrift für Psychologie* 90, p. 67f., 1922). See also W. Fuchs' recently published work from the years 1912/14 (*Zeitschrift für Psychologie* 91, p. 146f., 1923), "Untersuchungen über das simultane Hintereinandersehen auf derselben Sehrichtung," particularly pp. 168f.; A. Gelb, "Versuche auf dem Gebiet der Zeit- und Raumanschauung," VI Congress for Experimental Psychology, p. 36, 1914; Gelb and Goldstein, *Psychologische Analysen hirnpathologischer Fälle I*, Leipzig 1920. For the principles for §§42 and 50 in particular, see W. Köhler, "Die physischen Gestalten in Ruhe und im stationären Zustand," 1920 (in detail particularly pp. 183f.).

very familiar, as is the complex "tree," each associated with its verbal name as well. But the perceptual grouping that I "extracted" only with difficulty, integrating parts of the window with parts of the branch, might never have occurred before. Hence such a grouping arises only with a chance wandering of attention, under very special circumstances, with greater difficulty, in cooperation with the familiar complex that is the letter N. This is how the theory of "associative predispositions" might explain perceptual grouping.

In the following we will deal chiefly with discriminating among groupings in the sense of a/bc as opposed to ab/c . For this question, what would a salient [*prägnant*] example look like? Here is an example of that kind of association: I am standing together with a certain Herr Tahör from India, and someone calls out, Herr Tahör! That is how I hear it, whereas I would have heard the same spoken sequence very differently if [p. 304] I weren't standing with this gentleman, and had never heard such a name under these circumstances, and if there were a girl by the name of Hertha in the room. [*"Herr Tahör!" is an instance of a/bc , while ab/c would be "Hertha, hör!" (Hertha, listen!)*—Tr.]

This is the sense in which an explanation purely by experience should be considered if the customary meaning of the term "experience" is taken seriously. (Cf. §39f.)

Furthermore, the mere invocation of words like "past experience" or "conditions of attention" does nothing to explain exactly how they supposedly accomplish the perceptual grouping: Each observed perceptual grouping phenomenon would have to be explained explicitly by the theory of association, and compared with alternative explanations for those same phenomena.

I [Proximity]

1. Present a series of dots in an otherwise homogeneous field, with alternating distances, for instance, $d_1 = 3$ mm, $d_2 = 12$ mm.

1: •• •• •• •• •• •• ••

Such a series of dots is normally seen spontaneously as a series of small groups of dots in the pattern ab/cd and not, say, in the pattern $ab/c/de \dots$. Seeing the second grouping ($ab/c/de \dots$) simultaneously across the whole field is completely impossible for most people.⁴

4. To begin with we concentrate here on this simple formulation of the question. We are dealing with only these two possibilities at first. Initially it is crucially necessary to contrast the most basic differences in results. If a certain grouping such as the current example is not compelling for a certain subject, then one

2. To be sure, what is meant here is seeing, not merely intending to see, a grouping. This may be clearer for series of dots like this:

2a: • • • • • • •
• • • • • • •

One sees a series of diagonal groups ••, slanting from lower left to upper right, in the pattern $ab/cd/ef \dots$. The opposite pattern, $a/bc/$

should not begin by getting lost in a discussion of why that grouping failed to appear, but rather seek first to strengthen the conditions (for instance, by increasing the number), in order to see whether the question at issue is testable with this subject. The investigation of the numerous beautiful features which can be generated in such experiments in addition to those intended here, and the resulting variations generated with different perceptual set [*Einstellung*], different distribution of attention or fixation, and so on, must be studied separately and, again, under experimental conditions that are as pure for that purpose and as salient [*prägnant*] as possible. This is discussed later.

It is necessary to concentrate on resolving one of the questions under consideration, on isolating one factor in the experiment. For instance, if the thought arises concerning rows 2a and 2b that, owing to experience with handwriting, the diagonal from lower left to upper right might be more favorable than the one from upper left to lower right (cf. §38f.), one should not confuse the issue, but rather should check at the outset (with enhanced patterns, say) whether the original factor prevails in the present case. It is typically easy to show that it does, just by suitable alteration of rows 2a and 2b.

[p. 305] These remarks on scientific method are necessary only because in psychology one is often accustomed to lose oneself in handling a multitude of details simultaneously, with special value placed on "subjective arbitrary preference," rather than on posing rigorous, decisive questions and seeking a pure resolution. ("Individual differences" too can and should be handled with strict scientific rigor.)

One technical point remains: one must carry out this kind of study under pure experimental conditions. For instance, one should not imagine that one has already fulfilled the experimental conditions for all cases of "a row of black dots on a homogeneous white field," by presenting such a row and then another just like it, but 2 cm higher, or by using a configuration characteristic of a certain apparatus or frame (cf. §22). One must beware of the tacit justification that the original is really all that is intended or should be paid attention to, is all that comes into question for this experiment. . . . The common piecemeal approach [*Einstellung*] of psychology makes it all too easy to conduct experimentation under conditions that are impure or disregarded in this sense.

Consider also Heinrich Hertz's humanly very instructive remark (in his "Untersuchungen über die Ausbreitung der elektrischen Kraft," Leipzig 1892, Introductory synopsis, p. 10) about his "Untersuchungen über die Ausbreitungsgeschwindigkeit der elektrodynamischen Wirkungen." He had detected faster propagation of electricity in the open air than in the wire but says, "In conducting these experiments, I did not in the least suspect the neighboring walls of having any influence. I remember, for instance, that I ran the live wire only 1.5 m from an iron furnace."

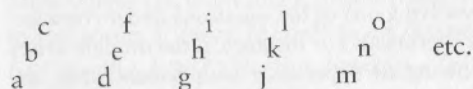
[p. 305] *de...*, the series of  long diagonals, is much harder to perceive.

Indeed, for most people it is impossible to see such a configuration clearly simultaneously across the whole field. If one does, with difficulty, succeed in seeing such grouping, it is a great deal less reliable and much more unstable than the first—for instance, in face of eye movements and shifts of attention.

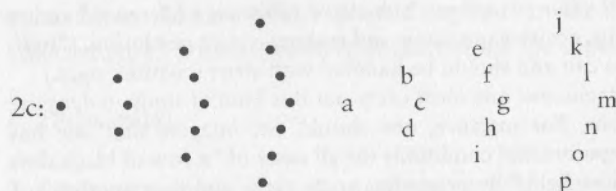
In other examples:

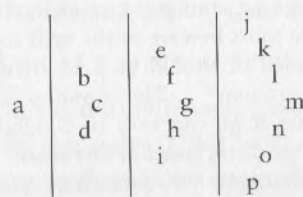


One sees a series of small diagonal groups , slanting from lower left up toward the right; thus, the grouping *abc/def/ghi...*, designating the dots from left to right:

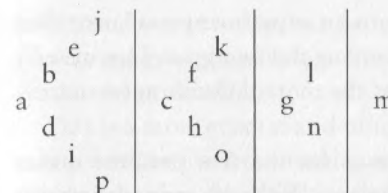
 etc.

But the opposite grouping, , that is, *ceg/fhj/ikm...*, is not seen, and is impossible for most to see simultaneously across the whole pattern.



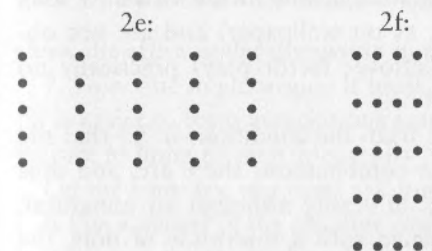
[p. 306] In 2c, one sees: 

but not (or only with difficulty, hard to see, and unstable) the corresponding other pattern:



2d: 

One sees the triplets *abc/def...* and not any of the many other theoretically possible groupings.



In 2e one typically sees the verticals, in 2f the horizontals.

3. If the configuration contains few dots, then the respective opposite grouping is easier to perceive. The result is no longer so unequivocal; the condition is in general entirely more unstable.

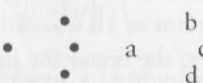
For instance, if one reduces series 1 to

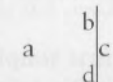
3a: 

then one can readily perceive the grouping *a/bc/de/f*; similarly, with 2a,

3b: 

one can get the grouping *a/bc/de/f* with the two long diagonals . Similarly, with 2c:

3c: 

one can get the pattern  (the angle of the long diagonals).

[p. 307] However, although with few dots the outcome sometimes is not unequivocal, it is often still possible to determine that there is a stronger

tendency for one grouping. For instance, in an experiment similar to that in §45, with rhythmic alternation in perceiving the two groupings at will, often still one grouping appears clearly as the more difficult, more uncertain, more unstable.

4. In series 1, 2a, and 2b, the conditions for the two patterns under discussion are not yet completely equivalent. With the second pattern, "leftover" dots result. That in itself exhibits a special, important factor (cf. part VII). Now, with respect to the leftover dots, series 2c, for instance, is similar; so is the other series if one arranges them in the form of a closed circle rather than a straight line. If the series are long (or distributed all over the surface, as on wallpaper) and are not observed right at the edge, then the leftover factor plays practically no role.

5. It would be wrong to conclude from the conditions in §3 that the larger the number of dots, the more combinations there are, and thus the harder the perceptual grouping. In reality although an unnatural, artificial grouping is harder to perceive with a multitude of dots, the natural pattern is not. An increase in the number of dots to the point of immensity—dot-patterned wallpaper—does not in the least make the naturally resulting pattern more difficult to perceive. Indeed, such arrangements do not tend at all to support the argument that groupings with larger numbers of dots are harder to perceive.

Although it is mathematically and theoretically the case that the more dots there are, the more possibilities of combination are conceivable, the facts do not support this at all. Actually, larger numbers of dots in the stimulus tend to promote fewer perceptual groupings; indeed, such configurations are often unequivocal under normal circumstances. With configurations of fewer dots, there are considerably more alternative grouping possibilities.

This has to do with a very general tenet: Proceeding from a few individual stimuli does not "self-evidently" produce a simpler, more stable, more elementary percept. The theoretical supposition that the simplest stimuli produce the simplest perceptual groupings is not at all warranted. With configurations like these, it is quite the opposite; the fewer the number of dots and the "simpler" the configuration, the more uncertain and ambiguous the resulting grouping.

[p. 308] 6. In all the cases under discussion, a first simple principle can be seen: Dots separated by small distances group naturally. Perceptual grouping of dots with large separations does not arise, or does so only with great

effort, and is less stable. In a provisional formulation: All else being equal, perceptual grouping tends to form more easily across smaller separations. (Factor of proximity.)

This is a most general and ubiquitous principle of perceptual grouping, and is not confined to visual grouping, nor even spatial experience. Continuous tapping rhythms, for instance, in the pattern of series 1

• • • • • etc.,

or in the pattern of series 2d

• • • • • etc.,

show the effect under discussion in a most definite way.

7. Now one might argue: It must, of course, be quite self-evident that "it is easier to form associations across a smaller distance." But it is premature to jump to such apparently "self-evident" conclusions.

On the contrary, one must ask further, concretely:

Is this a matter of the absolute distance between stimulus elements? Or is it more a matter of the relative separation? Can a function be established here at all? What kind?

Also, does the principle apply formally, in detail, in the same way in different domains? For instance, what if one uses parallel lines or surfaces rather than dots? What more precisely are the relationships among successive Gestalten as compared to those among simultaneous Gestalten? What about when they occur in, say, the acoustic domain rather than the visual?

Indeed, is it certain yet that applying the principle to the individual dots and the distances between them really does justice to the facts?

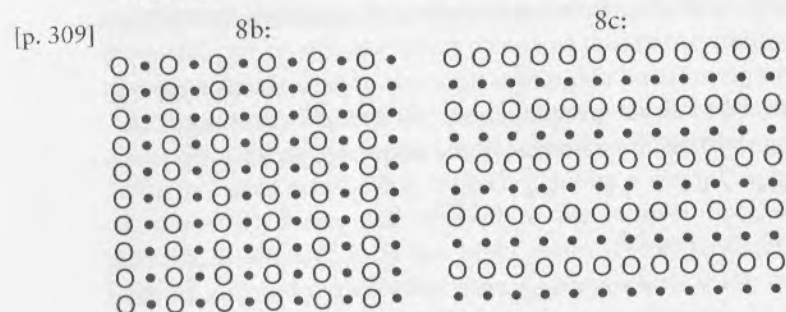
We will see that it is possible to determine particulars here. In the course of scientific development, the supposed "self-evidence" of a fact has often concealed the real problem for a long time. But first, consider a brief characterization of some other factors.

II [Similarity]

8. Present a configuration of equidistant dots in pairs of different color on a homogeneous field: for instance, white and black in a grey field, in the schema:

8a: ○ ○ • • ○ ○ • • ○ ○ • • ○ ○ • • ○ ○ • •

Or, better, fill a surface with this schema:



Or 8d: ○ ○ ○ ● ● ● ○ ○ ○ ● ● ● ○ ○ ○ ● ● ● etc.

One generally sees the grouping in which similar elements group with each other: in 8a, $a b / c d \dots$; in 8b, the verticals; in 8c, the horizontals; in 8d, $a b c / d e f \dots$

It is generally impossible to get the alternative grouping to appear simultaneously and clearly across the whole pattern: in 8a, $\dots / b c / d e / \dots$; in 8b, the horizontals; in 8c, the verticals; in 8d, any of the groupings $c d e / f g h \dots$ or the like.

If the number of stimuli is decreased, then the other patterns also become possible, like those in §3, but they generally prove to be more difficult and more unstable.

This leads to a second principle, which might provisionally be formulated this way: If several stimuli are presented together, then—all else being equal—they tend to group together in patterns in which similar stimuli appear to be combined. (Factor of similarity.)

9. A similar grouping is perceived, for instance, with continuous tapping rhythms (if they are not too slow) with strong and weak tapping in alternation:

analogous to 8a: . . ! ! ! ! ! ! ! ! ! ! etc.

analogous to 8d: . . ! ! ! ! ! ! ! ! ! ! ! ! ! ! etc.

In the first series, one hears $a b / c d / e \dots$; in the second, $a b c / d e f / g h i \dots$. Even if one attempts to maintain persistently an opposing pattern—an attempt which moreover is generally quite arduous—nevertheless it usually soon “flips” perforce back to the first, natural pattern; cf. §22.⁵ On the peculiarity of such successive Gestalten, see moreover §17.

5. In auditory patterns such as these, tapping along with it is very characteristic. Indeed, providing a continuous series of taps can produce the strong result of a series of motions.

[p. 310] This also works with musical pitches:

analogous to 8a: C C G G C C G G C C G G C C G G . . .

analogous to 8d: C C C G G G C C C G G G C C C G G G C C C . . .

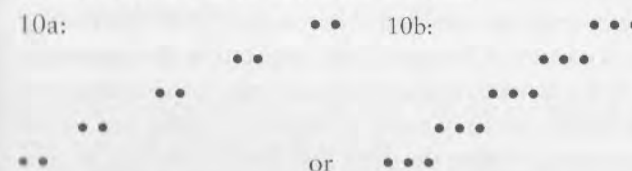
With such series, it is important to pay particular attention to crisp, clean stimuli. Preferably, the notes are pure staccato beats (we will have to deal with the psychology of the “legato” later) and, with regard to “musical” factors, use European intervals. Intervals on the Appunn tonometer [*a table apparatus that produces specific tones by blowing air past metal reeds, on the same principle as a harmonica—Tr.*] are particularly suitable.

Influences from certain modes of conduct can counteract this, just as can objective cues; but even these are not subjectively arbitrary. Since one preferably starts with supposedly elementary, tacitly obvious cases with few simple components, in psychology one has frequently become accustomed to viewing all this from the standpoint of subjective modifiability, in the sense of genuine “arbitrariness.” It is disconcerting in itself, that this can be the case in artificial examples having few components with a laboratory set [*Einstellung*], but it is another thing when listening to salient [*prägnant*], good, musical melodies in a musical setting.

10. In cases 8a and 8d, the conditions for the opposing “patterns” are not quite equivalent. Aside from the “leftover factor” (cf. §4), the group sequence itself also exhibits a change in direction, in the more remote or impossible pattern.

With 8a: ○ ○ ● ● ○ ○ ● ● ○ ○ ● ● ○ ○ ● ●, the $b c$ group is ○ ●, but the $d e$ group is ● ○. Or with the rhythm . . ! ! ! ! ! ! ! ! ! ! . . , $b c$ is weak → strong, but $d e$ strong → weak. This indicates a particular factor [see §11—Tr.].

This complication can be remedied by continuing the increase. In the tapping series, let two strong taps follow the first two weak ones, then still stronger ones, and so on, in the schema:



(with vertical distance indicating the intensity).

A corresponding visual series would be (on a green background) white, white, light grey, light grey, medium grey, medium grey, dark grey, dark grey, black.

Correspondingly for musical pitches:

- [p. 311] analogous to 10a: C C E^bE^bF# F# A A C C ...
analogous to 10b: C C C E^bE^bF# F# F# A A A C C C ...

11. In the form discussed so far, the regularity treated here presents only a special case. Not only similarity and dissimilarity, but also greater and lesser dissimilarity within a certain range still work in the same way.

With musical pitches, pure series such as

11a: C C# E F G# A C C# ...

11b: B C D D# F F# G# A B C ...

11c: C C# D E F F# G# A C# C C# D ...

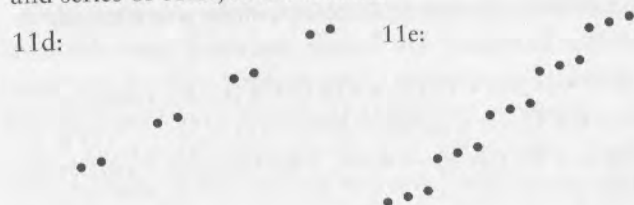
normally result in the pattern $a b / c d / \dots$

$a b / c d / e \dots$

$a b c / d e f / \dots$

that is, the groups that span the smaller distances.

This also works with corresponding simultaneous series of brightness and series of color, in the schema



If one considers this principle of the size of the difference interval along with that of proximity (I), there appears the possibility of a more general principle that encompasses them both, and to a certain extent encompasses the spatial, temporal, and qualitative domains as well. Specifically, if it turns out that distances of intensity and qualitative characteristics can be coordinated with a general regularity concerning the spatiotemporal ones—an assertion which certainly must be carefully tested, but which can be tested experimentally—then the cases discussed above can be considered as cases of the principle of proximity.

Thus domains that until now were psychologically segregated and heterogeneous can be compared quantitatively with respect to their regularity.

III [Combinations of proximity and similarity]

12. What happens when two such factors exist together throughout a stimulus configuration?

One can let the two factors work with each other or against each other. For instance, if the one is set to favor the tendency toward $a b / c d \dots$, then one can set the other to favor either the same pattern or the opposite ($\dots / b c / d e / \dots$).

This is similar to the way in which, through change in the distance relationships within the law of proximity (cf. §45), one can weaken or strengthen an existing tendency.

- [p. 112] For instance, in series 12a, the factor of proximity works in the pattern of $a b / c d / \dots$. With the lesser number of stimuli, it is not as unequivocally compelling as in a continuous row. The pattern $a b c / d e / \dots$ results very rarely here in pure spontaneous experiments; nevertheless, some people can get it to happen, although with more difficulty.

12a: •• •• •• ••

In series 12b, the factor of similarity (with that of §10) also works in the pattern $a b / c d / \dots$. Perceiving the opposite pattern $a b c / d e / \dots$ here is much harder than in 12a, and is impossible for most people.

12b: •• ○○ •• ○○

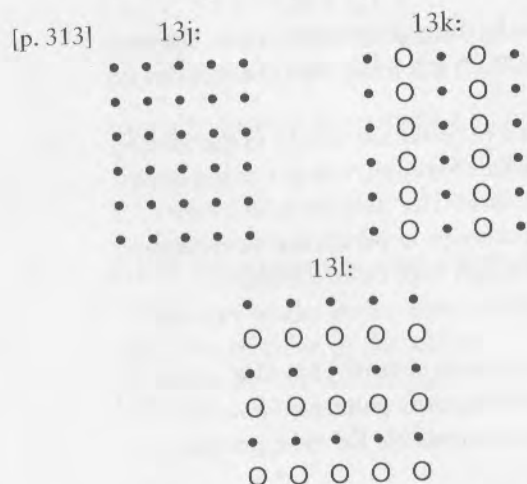
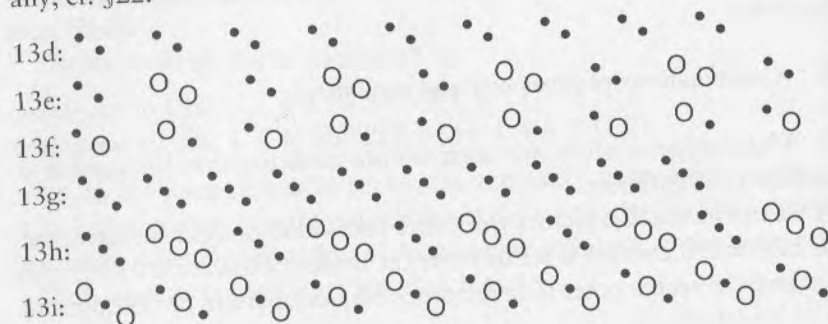
In series 12c, the factor of similarity is set in the opposite pattern from that of proximity. In spontaneous experiments with this series, $a b c / d e / \dots$ results more frequently than $a b / c d / \dots$. Aside from that, the series typically appears easily “confused.” Artificial production of the pattern $a b / c d / \dots$ simultaneously across the whole pattern is relatively difficult.

12c: •○ ○• •○ ○•

But the examples 12a, 12b, and 12c are not simple in the sense of §§3 and 4; so we will go on to others.

13. What is intended may be clearer to some people in more obviously unequivocal relationships.

The series below are of course to be exposed to observation individually; cf. §22.



In the original series, 13d, the distance relationships are selected so that the factor of proximity already works to some extent in the pattern $a b / c d / \dots$, though not as strongly as would be the case with a larger difference in the distances (cf. §45). The short diagonals $\bullet \bullet$, slanting from upper left to lower right are perceived more readily, while the opposite pattern of the long diagonals $\bullet \bullet$, slanting from lower left to upper right, is distinctly rarer, more difficult, and more indefinite.

With 13e, in which proximity and similarity work toward the same pattern, the result is the short diagonal grouping, less ambiguous and more definite. The opposite pattern is generally impossible to perceive, or leads at best to confusion.

With 13f, in which proximity and similarity work against each other, the factor of similarity typically wins: One sees the series of long diagonals $\bullet \bullet$. A clear pattern of short diagonals is impossible for most.

Series 13g, 13h, and 13i show much the same thing.

With 13k, in which factors of similarity and of proximity work toward the same pattern, the verticals result. With 13l, the factor of similarity, set up in opposition to proximity, wins; the horizontals result.

14. Through systematic variation of the distance relationships in the original series, one can seek to determine the region in which, with the similarity factor set up in opposition to proximity, similarity wins; and thereby one can seek to test the strength of the tendencies more precisely (cf. §45f.).

15. This also works with tapping rhythms. If one starts from a series in the pattern of the schema

15a: $\dots ! ! ! \dots ! ! ! \dots ! ! ! \dots$ etc.

here the factor of similarity works toward the pattern of $a b / c d / \dots$. In an ongoing series, not too slow, one now lets the factor of (temporal) proximity work in the same or the opposite pattern. With both working in the same pattern, there results strengthening of the $a b / c d / \dots$ tendency; if proximity opposes that pattern in similarity, there is weakening of that tendency or eventual dominance of the opposite pattern $\dots / b c / d e / \dots$.

15b: $\dots ! ! \dots ! ! \dots$ etc.

15c: $\dots ! ! \dots ! ! \dots ! ! \dots$ etc.

16. This also works with pitches (staccato series):

16a: C C F F C C F F C C F F C C F F ...

16b: C C F F C C F F C C ...

16c: C C F F C C F F C C ...

16d: Likewise with use of differing intervals in place of similarity and dissimilarity:

16d: C C# E F G# A C C# ...

16e: C C# E F G# A C C# ...

16f: C C# E F G# A C C# E ...

17. If one operates with systematic variations of the spatial and temporal distance relationships opposing the factor of similarity, then the results soon show a clear disparity which indicates one of the differences in the laws of simultaneous as against successive Gestalten. In simultaneous Gestalten the factor of similarity appears to work differently than in successive Gestalten, in general much more "strongly."

If in simultaneous series, one starts with original series as in §13 (the factor of proximity by itself), then introduction of the factor of similarity in opposition to it proves it to be very strong. With parametric variations one can easily achieve complete dominance for the pattern favoring similarity. Conversely, if one starts with series having equal distances (the factor of similarity by itself), then it is hard to attain dominance of the factor of proximity working in the opposite direction.

If in successive series, one starts with original series as in §15 and §16 (the factor of similarity by itself), then introducing the factor of (temporal) proximity in opposition easily leads to dominance of the latter. Contrariwise, if one starts with series of the same stimulus (the factor of temporal proximity by itself), then introducing the factor of similarity in opposition, it is not so easy to attain dominance for the latter. Here binding via similarity means something more, something different, for simultaneous structures than for successive structures.

18. A principle of proximity is also known to apply in stroboscopic motion: Movement is normally⁶ perceived chiefly across the smaller (spatial) separation.

18a: $\begin{matrix} \bullet & \bullet & \bullet & \bullet & \bullet \\ a & b & a & b & a \\ \rightarrow & \rightarrow & \rightarrow & \rightarrow & \rightarrow \end{matrix}$

Successive exposure of all the *b* dots after the simultaneous exposure of all *a* as a rule produces movement from *a* to *b*, from left to right, in the pattern of the smaller spatial separation and not—simultaneously across the whole pattern—the movement $b \leftarrow a$, from right to left.

If one has set up such a configuration in a “slider,” showing first the *a* and then the *b* for five pairs of dots with distances of, say, 5 and 15 mm, then via simple variation of the conditions, factors in the pattern of §4 and §10 prove to be effective in quite a powerful way. For instance, if one covers the first dot *a* on the left, then aside from the left-to-right motion of the dots in the small distance, one also typically sees motion at *a* from the right (in the large distance). If one covers them all, up to the second, third, or fourth *a*, then the right-to-left motion in the large distance typically still occurs.

A principle of similarity applies here too. All else being equal, motion is perceived chiefly among similar items:

6. See, more generally, Korte, *Kinematoskopische Untersuchungen in Beiträge zur Psychologie der Gestalt*, edited by Koffka, Leipzig 1919, p. 183f.

18b: $\begin{matrix} a & b & a & b & a & b & a & b \\ O & O & \bullet & \bullet & O & O & \bullet & \bullet & O & O \\ \rightarrow & & \rightarrow & & \rightarrow & & \rightarrow & & \rightarrow & \end{matrix}$

Here the spatial distances of the stimuli are the same, but their featural quality is different. There results chiefly a motion from left to right, not from right to left like this:

$\leftarrow \leftarrow \leftarrow \leftarrow$

Here the factor mentioned in §10 definitely comes into play again. With the latter motion, the qualitative transition in the groups would alternate [$O \leftarrow \bullet, \bullet \leftarrow O$ —*Tr.*]. Thus a pure experiment, as above, would use not pairwise alternation in quality, but rather an increase. Other commonalities and differences relative to the regularities of simultaneous- ϕ and motion- ϕ will be reported later.

18c: If one introduces the factors from 18a and 18b together in the same pattern, then that produces strengthening of the common tendency. Each, more equivocal in itself, becomes more unequivocal. If one introduces the factors in 18a and 18b together in opposition to each other, then one would have to search for the spatial conditions which overrule the factor of similarity, and those which are just barely defeated by the factor of similarity. I do not yet have on hand sufficient experiments on this question; but it appears that here too, when the effects of spatial distance and similarity are in opposition, the factor of similarity proves to be very strong.

IV [Common fate]

19. If the configuration 2d is present, clearly in the grouping determined by the factor of proximity:

$\begin{matrix} \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet & \bullet \\ a & b & c & d & e & f & g & h & i & j & k & l \end{matrix}$

If there is now, unexpectedly to the subject, a joint alteration among its component parts before the subject's eyes, such as a sudden small upward displacement of several dots at once, then the effects of two principal types of action can be clearly distinguished from each other:

1. “Structurally consistent” changes, which are consistent with the objectively pre-existent groups: For instance, *d e f* shift upward slightly (or *d e f* and *j k l*).

II. "Structurally inconsistent" changes, in which the common fate in the change is contrary to the pre-existent grouping: For instance, *c d e* simultaneously shift upward slightly (or *c d e* and *i j k* or *h i j*).

[p. 316] Shifts of the second kind occur "not nearly as smoothly" as those of the first. Often the first are easily just "noticed," while with the second there is a characteristic process that usually occurs. It is as if there were a special (much stronger) "resistance" against such changes. A jolt occurs, possibly disorder, confusion in the series, often a flip-flop: The component parts affected by the common fate (in opposition to the law of proximity) end up combined. With shifting of *c d e i j k l*, the series no longer has the grouping *a b c / d e f / ...*, but rather the grouping *a b / c d e / f g h / i j k l*.⁷

This holds objectively as well. The threshold for the perception of such changes seems to be different for types I and II. But this will be dealt with later.

20. Let us tentatively designate this factor under consideration as that of "common fate." The cases mentioned in §19 are only special cases of its effectiveness.

It is important here that what comes into question is not necessarily only common identical changes. Something similar shows up with piecemeal, individual, very different changes, such as diagonal shifts of three dots in a pattern of type I or type II, or "rotations" such as *c f i l* downward, *e h k* upward (cf. part VII). This also works with qualitative changes as well.

This principle too has a very wide area of application; how wide will not yet be dealt with here.

V [Prägnanz]

21. Set up a batch of series as follows: a starting series like

Example 1: •• •• •• •• ••
a b c d e f g h i j

7. Here is an experiment which results in particularly striking observations: Using a series of vertical lines, or even just three of them, with the distances: •• •, saliently [prägnant] set up *a b / c* or *a / b c* and perform joint horizontal shifts with two lines: smaller and larger; structurally consistent and, for comparison, structurally inconsistent. Characteristic phenomenal events are observed, especially by people with strong visual dispositions, including the perception of "surfaces"; cf. §48.

Make the distance between *a* and *b* (likewise between *c* and *d*, etc.) $d^1 = 2$ mm, and the distance between *b* and *c* (likewise between *d* and *e*, etc.) $d^2 = 20$ mm. Now set up other series, in which the location of dots *a*, *c*, *e*, *g*, and *i* remains unchanged, keeping $d^1 + d^2$ constant, but systematically permitting variation in the location of *b* between *a* and *c* (and of *d* between *c* and *e*, etc.). For instance,

[p. 317]

Series A	$d^1 = 2$ mm	$d^2 = 20$ mm	$d^1 + d^2 = 22$ mm
B	5	17	22
C	8	14	22
D	11	11	22
E	14	8	22
F	17	5	22
G	20	2	22

This is the schema. But it is necessary to operate with a larger number of series (with smaller stages of variation). Vary the number of dots (groups) in a series as needed.

This also works with more unequivocal series. For instance, starting with the configuration

Example 2: c f i l
 b e h k
 a d g j

leave the locations *b e h k* unchanged, but systematically vary the positions of the *c f i l* dots in stepwise shifts to the right, and those of the *a d g j* dots by identical shifts to the left (cf. §45, examples I-IV).

If one has set up a large number of such series and now presents them individually (in a single pure experiment), what happens is the following.

This is not just a matter of a bunch of steps that have psychologically similar weight. Primarily, three distinctive kinds of impressions become prominent. Using example 1, they are

- The *a b / c d / ...* grouping, most unequivocally, most definitely, most undeniably in configurations patterned according to the beginning rows of the table above;
- The */ b c / d e ...* grouping, in configurations in the pattern of ending rows of the table above; and
- In the middle (series D), the equalized "uniform series": a third grouping that is characteristic in itself, equally remote from either of the others. This corresponds with the form of five points arranged in a cross in example 2. Cf. §45, example IV.

This is the way it works in single pure experiments. We will see that there is a way in which objective factors can work in opposition here.

In a single pure experiment, there are often intermediate series, lying between these distinctive regions: not unequivocal to the same degree, not quite as salient [*prägnant*], "less definite" in their character, less pronounced, and often more easily seen in terms of one grouping or the other.

Each of the three kinds of impression, most pronounced in a certain region, has its own range. Thus intermediate series near the middle one are typically seen in a single pure experiment as "not quite equal," even if the difference in distance is quite clearly above the threshold.

[p. 318] This can be illustrated by another example. The multiplicity of angles from 30° to 150° (with one leg fixed horizontal) is psychologically perceived not simply as a multitude of equal psychological steps, as numerous as the ability to distinguish among them may suggest. Rather, the primary, distinctive impressions are the acute angle, the right angle, and the obtuse angle; these three qualities become prominent more or less purely from the outset.⁸ The prototypic right angle, for instance, has its own range: An angle of 93° typically appears as a—somewhat imperfect—right angle. Intermediate angles have a "less salient" [*unprägnanter*] character; they might be seen most easily in the pattern of one or the other salient steps [*Prägnanzstufe*]. If one concentrates further on these shapes, the initial number of three salient angles [*Prägnanzcharaktere*] can increase, with new intermediate steps [*Prägnanzstufen*] developing in between.

It is of great importance here that a shape close to a salient step [*Prägnanzstufe*] appears primarily as a somewhat "poorer" version of it. An angle of 93° is not perceived chiefly as this actual angle. What a forceful interaction with the material is required in order to have such a form as a characteristic one! Rather it is perceived psychologically as an "imperfect" right angle. This is clearly proven in the experiment, most blatantly in the regularity of the tendency toward the salient [*prägnant*] shape. In

8. The following experiment is an excellent illustration: Start with this configuration

- and generate a series of variants from it, in which the two dots on the left remain unchanged, but the dot on the right shifts downward in small steps. Under appropriate conditions for surveying the entire pattern, characteristically distinctive shapes are perceived: the initial right triangle; the very different isosceles triangle, tilted; the isosceles triangle with its base vertical on the left; and further correspondingly. In this experiment a variety of Gestalt factors are beautifully comprehensible, as are other conditions of "combining" also. This will be dealt with later.

tachistoscopic presentations, even in the case of considerable deviations, the observer often sees simply a right angle, by assimilation to the salient prototype [*Prägnanzform*].

This is evident in other circumstances as well: Forms that are close to a salient shape [*Prägnanzstufe*] often result in an impression of "not quite right," of a "poor" salient shape [*Prägnanzform*], "somewhat askew," "somewhat wrong," without it really being possible to indicate in what direction the "wrongness" lies. Indeed, such deviations have certain types of qualities. For instance, in tuning a violin, a "not quite right fifth" often seems clearly wrong, without one being able to judge whether it is too high or too low. This quality is typical whether the fifth is too sharp or too flat. All this must be dealt with later.

[p. 319] In general, if one varies a component, such as the location of the *b* between *a* and *c* in example 1, in systematic steps, then the resulting impressions are psychologically not a mass of individually characteristic impressions consisting of evenly balanced matched steps. Rather, particular salient steps [*Prägnanzstufen*] occur, each with its range; the progression shows breaks. Intermediate steps typically appear as related to one of the salient forms [*Prägnanzformen*].⁹

VI [*Einstellung* or set]

22. One should distinguish sharply between the objective conditions discussed in §21 and those under which a single pure experiment does not set forth one of the established variants. In the latter case, one continually varies what is in front of the subject's eyes or, comparably, operates with particular sequences or with simultaneous presentation of such series.

If one observes the series in example 1 (§21) one after another in order, preferably with rhythmic transitions from one to the next (for instance, following a metronome set to one beat per second), a new factor soon emerges: the factor of objective set [*Einstellung*].

If one starts with series A and goes successively to G, or conversely from G to A, it emerges that the initial perceptual grouping—starting from A, the grouping *a b / c d / . . .*; from G, the grouping *b c / d e / . . .*—persists longer, very often past the middle series D, until finally, often only for one of the last series, it flips to the opposite characteristic group-

9. Something similar also occurs in the purely qualitative domain, for instance, with respect to the qualities that actually occur in the multiplicity of shades between white and black and likewise with chromatic colors. In creating salient steps [*Prägnanzstufen*], how much farther must a painter go to develop so many more!

ing. With experienced subjects and pure experimental conditions, the region of this flip is a readily available quantitative measurement; cf. §46.

Thus a given configuration, for instance, series C, creates different results if preceded by series A and B than if preceded by G, F, and E. This is the case with visually continuous displacement, but it is also already the case with only a single preceding series.

[p. 320] In short, if a series is a component of a sequence (or part of another combination), that is generally decisive. A configuration that results in a particular grouping in one sequence results in another particular grouping in another sequence. Moreover, a configuration which, when presented by itself, would produce ambiguous results, or results in something unclear or imprecise, results in a regularly specific grouping when presented in a sequence.

This factor of set [*Einstellung*] is very strong. Through its operation, even configurations that when presented alone are typically unequivocal can lead to a different grouping.

It is customary to attribute such effects to purely subjective conditions, which makes it easy for them to display the familiar characteristic of ambiguity. But this is actually a matter of regular, objective factors from the outset. Here, whether a particular series is a component of a combination with a certain other series depends from the outset on the objective configuration. Exposing a series M immediately after series L, or with it, is objectively different from exposing series M after series N, or separating the exposures by a time interval of several days.

If one opposes this by claiming that, in considering this set of series all at once, of course one could choose one sequence or the other entirely by subjective whim, or even choose to observe a specific one together with the next higher or next lower, one thereby misses the point; such a thing is possible only if the stimulus configuration (what is objectively presented) specifically allows just such ambiguity and so does not force a certain combining. That is a very particular special case, which, quite strange to say, is usually seen as the fundamental one. Besides, as we will see later, even in such cases, purely subjective factors typically are not at all "arbitrary" in the common meaning of the term, but have their own characteristic regularity.

It is clear that one must take this factor into account very carefully in experiments.

It should be noted that, apart from such successive set [*Einstellung*], there is also a simultaneous set that works in a comparable way.¹⁰ Also,

more generally, certain conditions of the "field," along with the set, are essential in deciding the matter.

VII [Good continuation and closure]

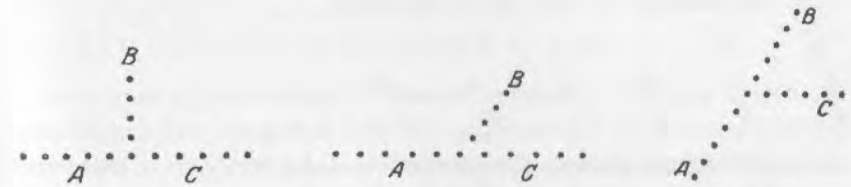


Fig. 1

Fig. 2

Fig. 3

[p. 321] 23. If, for each individual dot, one takes into account all of the individual distances between dots, then theoretically, according to the law of proximity, in figure 1: The dots in the left half of the horizontal line (group A) are closer to the dots in the vertical line (B) than to those in the right half of the horizontal line (C). Likewise, the dots in C are geometrically closer to those in B than to those in A. Yet the result is "a straight line on which a vertical line is standing"; that is, $/AC/B$. Theoretically, figure 1 is not all that simple. In terms of the distances between dots, $/AB/$ and $/BC/$ should be equally favored over $/AC/$. But according to that reasoning, $/BC/$ in figure 2 should be favored over both $/AC/$ and $/AB/$. Nevertheless, the result of spontaneous experiments with figure 2 generally is not $A/B C/$, but $/AC/B$ —"a horizontal with a diagonal line."

Similarly, $/BC/$ should be favored in figure 3, but what typically results is $/AB/ C$ —"the slanted straight line with the short horizontal."

One sees this effect more strongly and more compellingly in configurations such as figure 4.

Here, geometric consideration of all the individual distances between dots would result in $/CD/$ favored over $/BD/$, $/FG/$ over $/EG/$, etc.

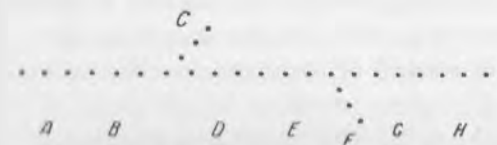


Fig. 4



Fig. 5

10. See footnote 4.

Instead one typically sees /A B D E G H.../ and C and F, that is, a long straight line with short slanted lines.

In place of these configurations of dots, we could even put objectively continuous lines (figure 5). For the theoretical situation under consideration here, the results remain the same.

24. One can also ask why in, say, the series

c	f	i	l	o	
b	e	h	k	n	etc.
a	d	g	j	m	

[p. 322] it is so difficult to produce the pattern /c d e/, /f g h/, /i j k/... that even in configurations with smaller distances, it does not result spontaneously across the whole series.

Likewise, in configurations in the form of zigzag lines (figures 6a, 6b), one can ask why there typically results a zigzag configuration of the straight component segments.



Fig. 6a



Fig. 6b

And similarly in figure 7.



Fig. 7

25. Here again one can even set up the factor of similarity at the same time as that of proximity (as, by using different coloring and different distances between dots) to take effect in either the same or opposite directions and, thereby, strengthen or weaken or overcome the effectiveness under discussion.

26. What is happening in §§23 and 24? The "continuous straight line" is favored, the "group in one direction." True, one could immediately

think up certain very special theoretical possibilities here. But it is nonetheless significant in itself that what happens here does not appear to be limited to the visual domain. For instance, figures 6 and 7 in §24 are demonstrably similar in principle to experiments in the acoustic domain with series of tones or even continuous tonal glides, such as

C D E F G F E D C D E F G F E D C... etc.

C D E F G G F E D C C D E F G G F E D C... etc.

In such series, even if there is some characteristic difference as well, the result typically corresponds with that of the series in §24, figures 6 and 7.

27. But is only that which is continuously straight favored like this? Only the configuration of one direction, just on the basis of many identically aligned distances between dots? No. Instead of the straight course along a series of identically aligned individual distances, one can set up very different configurations:

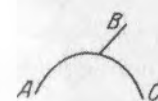


Fig. 8



Fig. 9

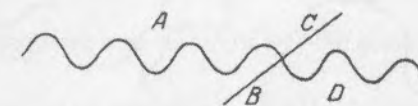


Fig. 10

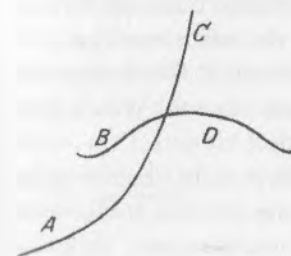


Fig. 11

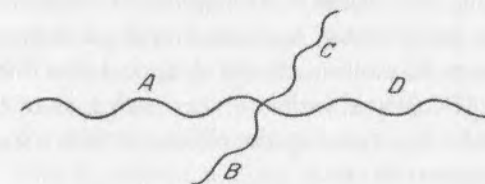


Fig. 12

[p. 323] Figures 8 and 9 typically occur as /A C/ B, not /A B/ C or A /B C/.

Figure 10 occurs as A D / B C and not, for instance, A B / C D.

Figure 11 occurs as A C / B D rather than A B / C D.

Figure 12 occurs as A D / B C rather than A B / C D.

In figure 13, just try for the pattern a b e f i k / c d g h j as opposed to the natural a c e g i j / b d f h k!

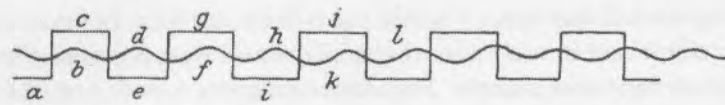


Fig. 13

28. One might think that it is simply a matter of the angular conditions at the critical point of intersection: 180° at the intersection point would be more favorable than acute or obtuse angles. Certainly such an angle is often an important factor in contrast with the course of the straight line, etc., as a form of inhomogeneity in the course of an important factor (cf. §50). But that does not yet capture what is essential here, as seen in examples like figures 14, 15, 16, and 17:



Fig. 14



Fig. 15

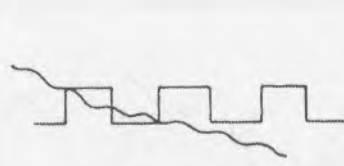


Fig. 16



Fig. 17

29. At this point one can pose a general experimental question. As one of many instances, take a curved arc A and add the two pieces B and C to it, as in figure 8, with systematic variation of B and C. Which appears to group with A and which appears to be separate from A? Which presents the continuation of A, appears "at one" with A?

If C "wins"—that is, the result is that AC/B is more obvious than AB/C —then one can replace C with a C_2 and see whether it too wins out over B; etc.

Likewise one can replace the "defeated" B which does not appear to be the continuation with a B_2 and see whether it too is defeated relative to C, then with a B_3 , B_4 , and so on.

Clearly, posing the question in this way requires extremely broad experimentation. For purposes of illustration, let us single out a quite simple case: Typically figure 8 results in AC/B . C appears to be the continuation of A, to group with A. One can now vary the arc in many ways [p. 324] without really changing that result. Figure 18 also results in AC/B . The same is often true even if one sets up C as a straight line on a tangential course, as in figure 19.



Fig. 18



Fig. 19



Fig. 20



Fig. 21



Fig. 22



Fig. 23

If one sets up tangents and circular arcs, as in figure 20, the result is somewhat less unequivocal, although in most cases the grouping of the arc wins. Here the length of B and C also plays a large role.

It works much the same way if one sets up two "arcs" as in figure 21.

Alternatively, one can set up the tangents to be constant and vary the third piece, as in figures 22 and 23.

30. What happens in experimenting with such different ways of posing the question?

Certain cases stand out: "distinctive" cases resembling salient [*prägnant*] steps, cases of especially strong "continuations," particularly unequivocal "winners," "intermediate" cases that deliver less unequivocal results.

Overall it is soon clearly obvious what matters. When systematically varying one constituent piece, one can soon predict with great certainty what the result will turn out to be from the pattern of the layout. As a preliminary formulation, one might say it is a matter of "good" continuation, of "fitting the curve," of "inner belonging together," of resulting in a "good Gestalt" that exhibits its own particular "inner necessities." This may suffice as a very preliminary designation. For the purpose of a truly scientific comprehension of what is presented here, there are several methods of penetrating further into the present regularities, including methods that do not involve the question of "grouping." More about this later.

For now, just a few brief points:

- (a) Consider a certain curve with a mathematically simple regular course, large enough that by itself it makes the character of that course vividly clear—a straight line, part of a circle, a sine curve, etc. If one attaches in one case a curved piece with a clearly disparate regularity, and in another case a curved piece that presents the identical principle, that is, the mathematically regular ("logically required") continuation of the main curve, a curved piece that is demanded just like this, in this place, by the

mathematically uniform course, then in general the first case is preferred to the second, to get a result that is "at one" with the initial piece.

(b) But this is not a matter of mathematical "simplicity" in every sense of that word, nor of just any arbitrarily consistent regularity of the pieces. The mathematical formula for constructing the pieces can be quite complicated. The issue here depends less on simplicity of the course of the smallest components and much more on simplicity with respect to the course of larger components (subwholes), with respect to attributes of the whole.

(c) A certain type of salient [*prägnant*] attributes of the whole plays a distinctive role in this matter: attributes such as "closure," "symmetry," "inner equilibrium." For these purposes clearly symmetry, for instance, is by no means simply an "equality" of components. Logically, it can be correctly grasped only from the viewpoint of the whole, as an attribute of the whole.¹¹

* What is indicated here can become more strictly precise only with further study. It is clear that certain problems in pure mathematics and in set theory must be considered, particularly the problem of attributes of the whole in contrast with mere regularity among pieces.

Later we will deal with cases in which what is discussed here can be formulated in quite a simple way, relatively speaking.

31. Furthermore (figures 24, 25, 26):



Fig. 24



Fig. 25

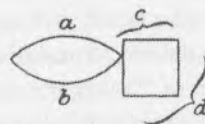


Fig. 26

32. The cases in §31 involve another factor that is quite important in itself, the factor of closure.

To formulate it quite generally: Given A, B, C , and D , if $A B / C D$ generates two closed progressions (running back into themselves), but $A C / B D$ generates two unclosed (open) ones, then $A B / C D$ is favored.¹²

11. Something like this also occurs with temporal succession (with a different kind of characteristics, due to the directionality of the time vector).

12. It should also be mentioned briefly here that experimentation shows that two mutually concave curves that close one another are favored to some extent over two curves that lie convex to one another.

[p. 326] For instance (figures 27, 28),

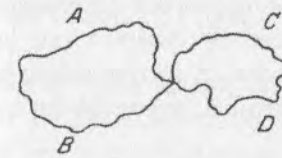


Fig. 27



Fig. 28

The factor of closure, though, can be isolated from the factor of the "good curve," the "good Gestalt." Figures 29 and 30 below, for instance, typically do not result in three closed forms, but in those determined by the "good curve." Here the factor of the "good curve" dominates over that of closure. This is clearer still when the lines and curves are extended past the starting and end points of contact.

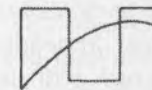


Fig. 29

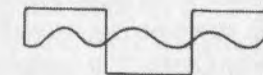


Fig. 30

33. Here is something else to try in this connection: Take two outlined figures such as two black squares, or figures like those below. On a homogeneous ground, lay them next to or overlapping one another. In which configurations does one clearly and compellingly observe the duality of the two figures? In which not? Which typically and compellingly result in something entirely different: the existence of a kind of new unity?



Fig. 31

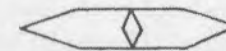


Fig. 32



Fig. 33

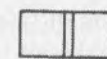


Fig. 34

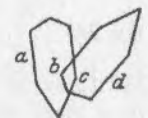


Fig. 35

A very rough indication of the results of such experimentation, performed systematically, appears in this simple example: The placement in figure 31 favors the result of the two six-sided figures, but the placement in figure 32 typically produces something entirely different: one long hexagon with a smaller quadrangle in the middle. A corresponding pattern in the first placement is extraordinarily unusual, impossible for most people to see.

It works the same way with two squares: The placement in figure 33 favors the result of the duality of the two squares; by contrast, the placement in figure 34 typically results in an oblong with a transverse strip in the middle.

[p. 327] This demonstration is not restricted to outline figures. One can get results with surfaces also, with strong consequences. Compare Fuch's investigations on transparency 1911/1914.¹³ By methodical application of the regularities discussed in this section, these investigations achieved extremely strong results, for instance, with respect to the colors seen.

What primarily is the situation here? Experiments posing the question like this very soon show what is decisive, in a very salient [*prägnant*] way. For linear combination as well as surfaces, the tendency toward the "good whole Gestalt" is completely in accord with the preceding discussion:

Figure 35 labels the four parts of the outline in figure 31, from crossing point to crossing point, with the letters *a*, *b*, *c*, and *d*. Using these labels, what are the circumstances?

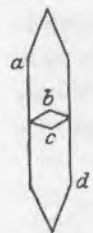


Fig. 36

(a) Linearly, in detail: */a b/* would result in a bad, inconsequential, "senseless" outlined figure with eight or nine sides which, only after this comment, probably the reader might now be able to see—not without effort. The same is true of */c d/*. By contrast, */a c/* is a much better Gestalt than */a b/*:¹⁴ *c* corresponds much better than *b* with what is adjacent to *a*. Indeed, *c* is what is "required." The fact that the *c*-parts join up with the *a*-parts in the favored straight line especially plays a role in this. The corresponding situation occurs with */d b/*.

(b) Regarding the surfaces: The surfaces enclosed by the lines */a b/*, */c d/*, */b c/*, */a d/* would result in bad surface figures. (The reader might try to grasp these surfaces as whole surface Gestalten.) By contrast, the surface

enclosed by the lines */a c/* is a much better whole surface Gestalt; likewise the one enclosed by the lines */b d/*.

And so figure 31 results in the pattern *a c / b d*, and not in the pattern *a b / c d*.

But in figure 36 (the same as figure 32, with labels) the emphasized cues are characteristically different. Linearly and in terms of surfaces, */a d/* and */b c/* (which would result in poor forms in figure 31) are favored.

The situation is still simpler if we use differently colored chunks of surface, as in figure 37.

One sees a slanted deltoid in a long oblong; if we label the surface chunks from left to right as *a*, *b*, *c*,



Fig. 37

[p. 328] and *d*, then one typically sees */a d/* as a whole oblong, with */b c/*; never spontaneously */a b/*, */c d/*. (The reader should try to achieve this: on the left a six-sided figure whose lower right tip is dark, on the right the longer six-sided figure whose upper left tip is dark.) Again it works as above.

With curves, very much as above, it is a matter of the tendency to result in a "good" Gestalt. To some extent this seems to be theoretically easier to comprehend than above. For instance, there is a tendency here for a whole surface to result in uniform (more homogeneous, more centrally symmetrical, etc.) coloring. Thus the law of similarity becomes a special case of that of the good Gestalt.

34. For these purposes, it is very instructive to try the following as well:

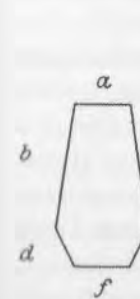


Fig. 38

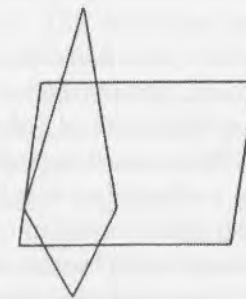


Fig. 39

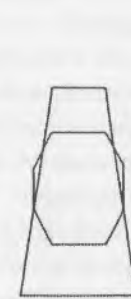


Fig. 40

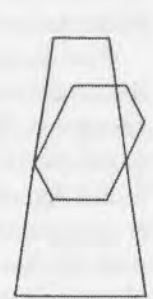


Fig. 41

13. *Zeitschrift für Psychologie* 1923.

14. Cf. §§30 and 39f.

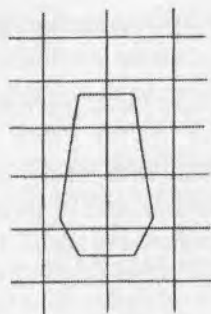


Fig. 42

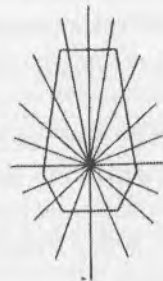


Fig. 43

Start with a given configuration (figure) and ask: What additions, what extras, what field is capable of ruining the Gestalt? What can one add to be quite sure of getting a spontaneous experiment to result in a pattern which is not at all the same pattern which is there without these additions?

[p. 329] It soon becomes apparent that a superb means of achieving this is to complete subdivisions of the figure into "good Gestalten," especially when there is "structurally adverse, poor" subdivision of the figure. And rigorously so: Whether more or less is added in a piecemeal sense, other additions do not have this consequence.

Label the lines in figure 38, the original figure, as *a, b, c, d, e*, and *f*. In a spontaneous experiment, figures 39, 40, and 41 typically come out as something different from the original. Schematically expressed, figure 39 comes out as *a, b, f ... / d, e, c ...*; figure 40 and figure 41 come out as *... a, b, c ... / d, f, e ...*; and figure 42 and figure 43 typically come out as the original figure.¹⁵

If we designate the initial figure as *A*, the additions of the first kind (the destructive ones) as *B*, and the last, nondestructive ones as *C*, what emerges is: One part, or partial configuration (*A*), alone or as part of a particular configuration (*AC*) results in something different than as part of a different configuration. What configuration it is part of is crucial to the nature of the result. Even if at first this formulation is concerned only with the formal condition of the "combining" within *A*, nevertheless it is also much more generally valid. The same is true for other formal cues, and, as we shall see later, for qualities as well.

15. Except, characteristically, in pathological cases that belong in the realm of mental blindness, or in cases of so-called alexia; see Gelb and Goldstein, loc. cit., p. 23.

Using the method indicated, one can make a person effectively blind to what is shown, even when in itself (alone or in another configuration) it is very clear and natural. This has consequences for recognition and indeed even for perceivability, on which we will report later.

35. One might think that what is meant by a "good curve" in the preceding paragraphs is based on an extraordinarily regular relationship among the individual component parts (the "elements" of the configuration), such as the exact same direction followed by the individual spaces between dots in the case of a discontinuous straight line.

But that is not the case. Variations quickly show that it is not primarily a matter of the location of the individual dots, nor of the direction mutually followed by the individual spaces between dots. Rather, in essence it is a matter of what is happening on a large scale. What is at issue is properties of the configuration "from above, seen in terms of the whole," "major stretches," and attributes of the whole, even though in detail the formation may happen irregularly and perhaps indeed lawlessly in the smallest pieces.

[p. 330] To see this, one need only replace the straight lines and curves of the figures with configurations of dots which show the character of the curve in question in their overall course, yet meanwhile are variable in detail, possibly disorderly or irregular. Not a single individual interval needs to lie correctly on the curve; and this deviation can be strongly above threshold. Or one can crinkle the curves.

It is precisely the opposite of a matter of the placement of individual elements: What is primarily of importance, indeed what is first seen and grasped in such configurations, is what is happening on a large scale, the overall distribution. This is shown especially clearly in tachistoscopic experiments to be discussed later.

This does not have to do with piecemeal relationships of "elemental pieces" to one another, nor of the "degree of coherence" of stimulus pairs and of stimuli "from the bottom up." Consider figures 14–17 in §28. If two "pieces" display a tendency to appear "together," to result in "one unit," that does not seem to be an attribute that belongs to this pair of pieces as such. The same two pieces placed side by side piecemeal in other Gestalt configurations display other tendencies, including the opposite one; and this does not happen in a way that makes it likely that simply summing two simultaneous tendencies algebraically would bring it about. More on this later.

36. There is something further to point out here. A problem area already alluded to in §19 is closely connected with this matter.

Consider a configuration with clearly articulated structure, such as a Gestalt whose division into subparts is determined by one of the factors already discussed (as in figure 7). Then a second factor comes into question. Now we have to do with a distinction between the “structurally appropriate” and “structurally inappropriate” application¹⁶ of this second factor. This distinction works entirely consistently with the tendencies under discussion, in important ways that are clearly experimentally testable.

Under certain clearly comprehensible conditions, the two factors together, applied differently from each other, can still cause a “good” Gestalt. Beyond that, the cases of structurally appropriate and structurally inappropriate operation can be clearly distinguished.

37. The principle dealt with here, of which §§23–36 tentatively present only a part, has fundamental epistemological consequences. It makes genuinely sensible predictions possible, in a salient [*prägnant*] way, in contrast with the predictions of Hume and of traditional logic. More about this shortly in another connection.

[p. 331] VIII [Past experience]

38. Another factor affecting whether a certain grouping and segregation will result is familiarity or “past experience.”

In its simplest formulation, this principle asserts that if *AB* is familiar, and *C* is familiar, but *BC* is not; if they happen to be associated with something else (spoken names, etc.); or if *AB/C* is familiar, but *A/BC* is not; then there is the tendency for *ABC* to result in the familiar, frequently experienced, learned, trained pattern *AB/C*.

In contrast with the description in the paragraphs above, it is characteristic of this principle that fundamentally it has nothing to do with the contents, the combination, or any objective data about the configuration. In principle, which pattern will result depends only on objectively arbitrary habit or drill.

Here is the sort of thing that happens:

1. One will see figure 44, not according to the pattern of figure 45, but as *j u r y*.¹⁷

16. From this there also arise beautiful relationships to what the musician, for instance, calls “senseless phrasing” or accentuation, and even “illogical” phrasing.

17. [In the original German this word is *juni*, the name of the month of June.—Tr.]

2. One will see 314 cm in the pattern *a b c / d e* and not in the pattern *a b / c d e* or *a b c d / e*; thus as 314 cm, not 31/4 cm, not 314 c/m.



Fig. 44

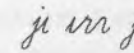


Fig. 45



Fig. 46

3. Someone accustomed to reading Greek will see figure 46 on a white ground partitioned into sigma and gamma, inherently a duality. But someone accustomed to the Latin alphabet will see it as a large ornamented V.¹⁸

4. Everything said in the earlier paragraphs also has beautifully fruitful relevance to production and “doing things in one’s own way.” If the alphabet drill in school is in the rhythm *a b c, d e f, g h i, j k l . . .*, it could just as readily be in another rhythm, such as *a b, c d, e f, g h . . .*; but when recitation resumes, the drilled pattern will result. The same is true for finger exercises on the piano.

[p. 332] 39. This works. Leaving it undecided here whether something like this really applies in general, to a great extent one can obtain extremely arbitrary patterns in arbitrary material through sufficient drill. Habit, past experience, will to a great extent determine the pattern or, in any case, frequently correspond with the pattern.

Even in these cases, it remains undecided here whether the fact of arbitrary items having “been there together” (been paid attention to at the same time), through drill of the pattern of connections, really covers the essence of the process.

Some scholars with a very common mindset [*Einstellung*] might basically be inclined to see everything that has been dealt with so far, but especially the circumstances in part VII, blandly in terms of the “fundamental” factor of “past experience.” From this there follow not only merely theoretical conclusions, but unfortunately also this: Rather than seeing the positive tasks which these circumstances open up for research

18. Saliently [*prägnant*] seen, these two compositions look very different. The attempt to produce them alternately on purpose may already make it evident that, aside from the bare issue of “combining,” entirely different Gestalt factors come into question, such as the function or role of a part in its whole, orientation to the main layout, level, and centering. But this will be dealt with later.

(and here fruitful exploration is possible), one casually shuts off these problems through such a thesis and believes them disposed of through the bland phrase "past experience."

Various theoretical approaches to the regularities under consideration are not discussed experimentally until later sections, but because of the importance of this one problem, a bit of that discussion is anticipated here.

One might think that the circumstances of part VII signify nothing other than that familiar complexes are favored. Aren't the "straight line," the "right angle," the "circular curve," the "square" familiar complexes in a very favored way?

And with regard to the earlier paragraphs: Aren't we very familiar with breaks between items to be distinguished? In print, don't the letters to be grouped together in words stand close together, while there are larger distances between words? What a thousandfold past experience! Doesn't past experience drill us to group together that which is the same color, for instance, in the displacement of things relative to each other when we are walking? And doesn't past experience drill us to group together that which has common displacement, common change?

All this, casually put forth, sounds very self-evident. But one must be firm in not believing that one has disposed of such important questions so casually. Based on the thesis of past experience in the above sense, one would surely be obliged to demonstrate concretely the specific past-experience drill cues in question for each of the circumstances discussed, and its regularities. One must also show concretely that alternative

[p. 333] groupings in fact have no—or a correspondingly inferior—basis in past experience, and also that, for gaining the past experience, the assumed "arbitrariness" by itself is actually sufficient. As soon as one really takes these problems seriously, it quickly becomes evident that all this is not by any means as blandly obvious as the answer deceptively implies.

This applies even in cases in which the situation initially appears to be very clear. As an example, consider the right angle, which is in fact favored. Think of tables, cabinets, windows, corners of rooms, houses. Isn't the right angle already there for the child thousands of times in experience? As self-evident as this sounds, one should go into it more closely. To begin with, is the environment of the child filled only with things made by humans? In nature aren't there a great many other angles, for instance in trees with their branches, surely not fewer in past experience? Of course this would have to be estimated quantitatively somehow. But still more important: In the sense of merely being there piecemeal in past experience, in the sense of the reception of sensory stimuli, is it actually

true that the cabinets, tables, and so on present right angles a thousand-fold? No; only in the extremely rare cases where these are in an effectively frontal-normal configuration. When the child looks at the table or cabinet, the most frequent cases by far are those where the stimulus-moderated experience is in fact not right angles at all. And if one wishes to apply, not the stimulus-moderated experience, but already the phenomenal, doesn't the problem arise all over again?

40. Even for a basis in "past experience," possibilities arise that are very different from piecemeal experience that has an arbitrary character in principle, in the sense of random pieces or groupings merely having been there often. But ignoring whether or not one wants to look at the circumstances in part VII as somehow determined by "past experience," the question nevertheless remains clear: In the circumstances discussed, are there objective regularities or not? If so, which ones? Just what is the regularity, in greater detail? These are research questions which cannot be disposed of by the word "experience."

For research, the question of objectively regular tendencies must be clearly distinguished from the kind of cases in which it is already well-known that one really is dealing with arbitrarily established connections.

Can one try to decide these things experimentally?

If the grouping *abc* on the one hand and the grouping *def* on the other hand are highly familiar, and now I set them next to each other, presenting *abc def*, does *abc / def* unequivocally result?

For this I select a domain in which enormous past experience is unequivocally present thousands of times.



Fig. 47

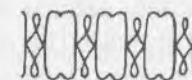


Fig. 48

Figure 47 is nothing but a very common W and a very common M set next to each other. Typically, though, one does not see them, but rather the looped form in the middle between the symmetrical curves left and right, which is thoroughly unfamiliar (not drilled). Thus if the W from left to right is made up of the parts *abc* and the M of the parts *def*, one typically sees not *abc / def* but *ad / be / cf*, or */ be /* between */ ad /* and */ cf /*.

This is stronger still when multiplied, as in figure 48. Very typically, instead of the four Ws and the four Ms, what is unequivocally seen is the group of four comical, unusual little loops and the closed curves. Who sees here, strictly simultaneously, the four Ws with the four Ms?



Fig. 49



Fig. 50



Fig. 51



Fig. 52



Fig. 53

Figure 49 is a J and an L; figure 50, an L and a J. Figure 51 is a p and a q and another p and another q, and so on. Figure 52 is a q and a b. Figure 53 is a 3 and a 4 and an E and an S.

Experimentation with very simple resources is already instructive in this matter. Place a mirror horizontally above or below a row of letters, or to the right or left next to letters or numerals written in a vertical column. One often sees very peculiar forms produced, entirely consistent with what is considered above. This also occurs with the plane of the mirror placed slightly oblique to the direction of the line of letters, and with other similar variations.

41. The experimental discussion goes further. Here is a bit more of that discussion, by way of example.

Just what is the state of affairs in question? One might initially believe that complex A is familiar and so is complex B, like the M and the W [p. 335] in figure 47, but AB arranged in this way is not familiar, nor is A or B familiar in /AB/; and that is why A / B does not result. But it would be an error in reasoning to think that this "explains" the situation. At most it

might explain why A / B does not result, but it does not at all explain what does result. Aside from that, though, experimentation can test the assertion more precisely. For instance, in figure 54 too AB is not familiar, yet A / B nevertheless results more readily; and one cannot assert that this grouping would be less unfamiliar. It is equally likely never to have come up.

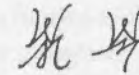


Fig. 54

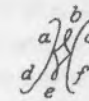


Fig. 55



Fig. 56

One might say, in figure 55, which is the same as figure 47, but with labels, it is true that A (= a b c) is familiar and B (= d e f) is familiar, but so are a d, c-f, b-e, and even a d / c f. One might say this quite casually, but concerning b-e it is false. Can one really believe that the grouping b-e has actually been there in real past experience more often than b in a c and e in d f? With a-d and c-f it is different. One can quite rightly assert that such groupings have very often been there, and more often as A and B, so more strongly. But in figure 56 is not the tendency to result in a d / b e / c f very distinctly still there? Yet one cannot assert that the / a d / and / c f / of figure 56 are at all familiar to the necessary extent.

These cases are singled out for discussion. Systematic experimentation, including variations in the relative location, shows furthermore that the configurations are "sensitive" in a very characteristic way: always in conformity with the strength and salience [*Prägnanz*] of the pertinent objective factors.

But also, what is going on with the formation of the individual letters themselves? In a certain sense, they too are historically "arbitrarily" established formations. What is going on—and very much from the beginning—with their variability, their range of "acceptable," immediately recognizable variations? We will come back to this problem in another context. Here we just remark briefly that these formations too are very sensitive to certain variations and can collapse into something strange or even unrecognizable; yet other variations, which introduce much more modification with respect to the sum of the individual parts and their locations, disrupt nothing at all, but rather yield the "same"

[p. 336] formation, blandly recognizable, in the same pattern. This does not by any means work in the sense of averaging the experience abstracted piecemeal. With such historical formations, psychologically one does not have to do with complexes of summative habit. Rather, they too are psychologically essentially determined by structural regularities, corresponding closely with those of part VII.

42. Does one not also see things like the figures in §40 here and there in reality?

In the moonlight I come upon a still, dark body of water. What is that wondrous luminous form there across the way? It is a small pale suspension bridge which is reflected in the water; but what does it look like? Bridge and reflection together exhibit a wondrous whole, entirely different from anything that is familiar in real experience. Who could imagine such a peculiar figure over there? The way it looks is totally improbable. Even though I know it is a bridge and its reflection, and the form, as I see it, is as improbable as possible, that simply does not help at all: Grouping and partition do not occur according to "bridge" plus "reflection," but completely differently, according to the regularities that have been discussed, according to what has symmetrical closure. And of course it is not in the least the case that somehow past experience of reality would actually favor symmetry in this way.

And likewise the peculiar figure over there? A group of trees, right at the water's edge, together with its reflection. How this form occurs against all experience! And even the individual tree over there with its branches above and below!

Is it an answer to say that these are unfamiliar conditions?

As a rule, in natural life, the pattern corresponds with reality. Must that be interpreted to mean that piecemeal, summed-up, individual past experiences are always the basis of it all? One relatively seldom sees anything like the sights mentioned above. Conversely, could not this be due to biological regularities at work in receiving information, regularities typically quite adequate in our world, but which under rare, biologically atypical conditions regularly lead to "false interpretations"? Biologically, is it not very generally true that there are regular, general kinds of organization, modes of operation quite adequate under their biologically regular conditions, which are "defective" under atypical conditions? Nature does not at all seem to work in arbitrarily summed-up individual adjustments, but rather in the emergence of inherently regular, biologically typically adequate forms and methods of functioning.

[p. 337] The nervous system has developed under the conditions of the biological environment. It is no wonder that the Gestalt tendencies developed thereby correspond with the regular conditions of the environment. One certainly should not think of this development in terms of the emergence of some special kind of mechanical devices.

IX [Further considerations]

43. Other factors will be dealt with later; here, in connection with §7, we only want to pursue a bit further the experimental discussion of the factor of proximity in visual configurations, in a brief sketch of the larger-scale results.

For the factor of proximity, is it (a) the absolute magnitude of the distances, or (b) the difference in the distances, or (c) the relationship of the distances that is decisive?

(a) Consider a series (schematically)

• • • • • • • •

which appears to be in the grouping $a b / c d / \dots$, and in which the d_2 , the larger distances of 7 mm, represent the "pauses." One can easily generate a second series in which distances of the same size as d_2 function as the relatively smaller ones¹⁹ (schematically):

• • • • • • • •

This is vividly more unequivocal for cases of diagonal configurations, as in §2.

The individual absolute distance, the absolute separation between two dots, is simply not what is decisive in any case.

(b) Starting with an initial series, generate a number of series which all have the same difference in the distances, even though each series has different absolute distances. Also generate a number of series which have the same relationship of the distances, again varying absolute distances.

Already in simple observation, but especially with the systematic attempt to perceive the opposite pattern in each series, it becomes clear that in the series with identical difference, the relationships for the $a b / c d \dots$ pattern and for the $/ b c / d e / \dots$ pattern in the various

19. Cf. Köhler, *Die physischen Gestalten in Ruhe und in stationären Zustand*, p. 188.

series are extraordinarily different, corresponding with the large difference in the form of the series.

For instance, suppose that the difference is small in absolute terms, and the series with very small distances are unequivocally $a b / c d / \dots$. Then the series where the distances themselves are large, and the difference is therefore a relatively small one, are no longer as unequivocal, even if the difference itself is quite above threshold. They soon incline toward an approximately equal impression (cf. §21); neither $a b / c d / \dots$ nor $b c / d e / \dots$ is then especially favored.

(c) By contrast, in the series with identical distance relationships, corresponding with the vivid similarity in the form of the series, the results of experiments with the individual series are relatively much more similar. If the initial series favors a pattern of, say, $a b / c d / \dots$, the same is also true with quite wide variation. The conditions for generating the opposite pattern remain largely the same, and much more equal in any case than in the series with identical differences.

More precisely, the same change of the initial distance constitutes much more of a change for our purposes, much more strongly alters the strength of an existing tendency toward a pattern, in the series with identical differences than in the series with identical relationships.

Moreover, the series with identical relationships are not even fully equal. This is true even disregarding the different conditions for surveying the entire pattern, which depend on "augmented series" containing fewer constituent parts or groups in the same space, or the same number of constituent parts or groups in a larger total space.

With series that are varied like this, one has to do with series of very different total length. To exclude this variable and be able to make comparisons across the same lengths, one proceeds as follows: Start with an initial series in which $d_2 = d_1 + \Delta$ (difference). Series with the same difference in the distances will have the differences d_x and $d_x + \Delta$; series with the same relationships, the distances nd_1 and nd_2 . Now, in order to achieve the same total length, we must have $2d_x + \Delta = nd_1 + nd_2$. Thus $2d_x + \Delta = 2nd_1 + n\Delta$, and hence $d_x = n(d_1) + \Delta((n-1)/2)$.

For instance, if in the initial series d_1 is 2 mm and Δ is 4 mm, then d_x is $4n - 2$.

If one varies n , one gets two series of equal length for each n , one with the same difference as the initial series, the other with the same relationship of the distances.

Sample values of n	Difference series		Relationship series		Sum of the two distances
	d_1	d_2	d_1	d_2	
$n = 3$	10 mm	14	6	18	24
$n = 5$	18 mm	22	10	30	40
$n = 7$	26 mm	30	14	42	56

Now if one compares the series of each such pair with one another and with the initial series, with regard to their distinctness and the strength of the tendency to result in a particular grouping, it turns out that, as n increases, the difference series very soon lose the distinct character of the initial series, but the relationship series do not. This is only the crudest outcome of this experiment; we will come back to other aspects of the results later.

44. In arrangements like the examples cited in §§1 and 2, the results were to a great extent unequivocal. The "natural" grouping occurs a great deal, and the corresponding opposite grouping hardly ever arises spontaneously, simultaneously in the whole. In efforts to generate that opposite grouping artificially, very characteristic difficulties arise: The observer often finds it necessary to grasp a successive synthesis of the grouping, pair by pair. Then, during the laborious further synthesis, already synthesized parts often "fall apart" again or topple back into the natural pattern. If somehow the pattern really does manage to succeed eventually, then its generation very often takes a considerably long time.²⁰ Time measurement in such experiments very often yields blatant results, for instance, if one first sets this task and then the task of "generating" the other (natural) grouping, which latter is usually present in a sudden toppling over.

Often, with the effort to generate the desired grouping, jumbled forms arise instead.

In such an experiment, if getting the opposite grouping really does finally succeed clearly and simultaneously across the whole pattern, then it

20. The well-known finding of the "Gestalt time," that is, the span of time "necessary to produce a Gestalt," is erroneously viewed as a feature in producing a Gestalt at all. Such time spans crop up primarily if one is dealing with producing a Gestalt that is not unequivocally determined by the configuration and is not compellingly advanced by the objective relationships. In fact it is not true that there is first a sort of "sum," and only out of that is a Gestalt produced, which takes time.

turns out to be very unstable. Mostly it topples over very quickly by itself. Indeed, the slightest disruption, the slightest relaxation of concentration, and the strained "will" typically has toppling over as its consequence.

[p. 340] In experiments of the earlier paragraphs, it is generally unnecessary to take conditions of fixation point, eye movements, placement of attention, or distribution of attention into special account. On the one hand, it is of course true that these features depend secondarily on the presented configuration (of which more later). On the other hand, regarding our question about results in the entire series, they are largely irrelevant in these designs. Even if one sets them up in an opposing, unnatural way, for the most part this changes nothing essential. The natural grouping still clearly remains the favored one. In experiments on systematic "generation of the opposite" with natural and opposing groupings, once again distinct differences between the two appear. To be sure, when setting up the opposite, often some of it changes individually, but typically only in individual domains of the series, which leads to "unevenness" in the series. The exception is with subjects who, having been drilled with many laboratory experiments in generating arbitrary distributions of attention, possess an unusual ability to generate unnatural "modes of interpretation."

Experiments are also less unequivocal with observers who have been drilled in the European set [*Einstellung*] for scientific experiments of ascertaining all the details individually, each in itself. With such as these, one must try more rigorous experimental conditions. Nevertheless, it is not at all the case that experiments with such observers result in opposite instances, contrary to the distinction between the natural and the more unlikely grouping. Mostly one gets neither one grouping nor the other, but rather a thoroughly wretched enumeration of individual details.

In the effort to penetrate deeper into the regularities at hand, if one turns to less compelling arrangements, such as series designed with less striking dissimilarities in the distances, one enters a domain where the outcomes naturally show a much larger range of variation. One must then take "subjective approaches" into account individually and be concerned about consistency. One must seek average values, taking the factor in §22 strongly into account, because of the necessary massing of trials. If one is careful to maintain pure experimental conditions in this regard, then once again unequivocal outcomes occur with various methods.

Even without such special experimental precautions, it becomes evident that one of the two groupings is the more "natural," more obvious one. Even with these less compelling configurations, still the opposite

grouping rarely occurs to the observer. If what is favored does not result, then it is usually a maximal "indistinctness" and uncertainty, a tendency toward a "jumble" or for "undifferentiated forms."

If one sets the task of generating the opposite or of generating the two opposing groupings in turn, then here too the unnatural one turns out to be distinctly more difficult, as shown by such factors as the spontaneous report of the subject, the time it takes to generate them, their lability, and the ease of disrupting them.

Fatigue, sniffles, numbness, lack of ability to concentrate or of "stick-to-it-iveness," and difficulties in understanding the instructions strengthen the favoring of the natural simple (though perhaps more chaotic) grouping as against the more unlikely one.

44] Technically, the most important factor here is the different strength of such configurations, as opposed to setting up other factors such as objective set [*Einstellung*] along with them.

45. If one wishes to go deeper into the problem of setting up the function of the law of proximity, there are various methods that deliver clear resolutions.

Here is an illustrative selection from a variety of experimental series.

Does the strength of the law of proximity differ with different-sized difference of distances? If so, in what way? Consider this schematic illustration of four configurations from the slanted-group series.



(a) One observes one of the four configurations individually and attempts to generate the contrary interpretation of the long slanted groups. If it turns out to be impossible with various subjects, one must try different allotments of the number of dots and the like.

I select the slanting-group series as an example here because with them it is possible to establish much more clearly whether unpracticed subjects really get the opposing grouping. The distinctions between the two patterns are more vividly evident and make surer confirmation more readily possible.

[p. 342] If one does the experiment for each series with maximal exertion of will and with consistency in the range for simultaneously surveying the entire pattern, then distinct differences of difficulty emerge for the individual series. The generation and clear simultaneous retention of the opposite pattern typically succeeds more easily and also more quickly with II than with I or even III. Toppling back into the natural grouping also shows the corresponding effect. Soon there emerges an order of difficulty of the series corresponding with the law of proximity: from the most difficult, III, through I and II to IV. For finer ranking of the series, one must sometimes work with specification of fixation and of the domain to which attention is directed.

It was possible to confirm this more precisely with the following tasks.

- (b) One of the series is exposed, with the long slanting pattern to be generated. When it is clearly there, the short slanting pattern is to be generated, and so on. The observer gives a sign each time the specified pattern is there; the times are measured.
- (c) Similarly, but alternating the patterns according to the beat of a metronome.
- (d) Best of all, with direct use of the factor of objective set [*Einstellung*]:

One observes one of the four series, generating the contrary pattern. When it is clearly there, one switches suddenly to a certain other of the four series, with the requirement to see this too in the contrary pattern, immediately. When using practiced subjects in such experiments, the results were as follows:

If the contrary pattern, that is, the long slating grouping, was achieved in I and one switched to II, in the great preponderance of cases the contrary pattern was clearly and immediately successful in II as well. On the other hand, if one began with the contrary pattern in II and switched to I, then against the observer's will, in the great preponderance of cases the normal grouping of the short slant was there, or it appeared jumbled. With the sequence II → I, an immediate result of the contrary in I was only rarely attainable.

In a methodical experiment

Going from a contrary pattern in	I	to II	mostly produced	long slant
	II	I		short slant
	II	III		short slant
	III	II		long slant
	III	IV		long slant
	IV	III		short slant
	I	III		??
	III	I		??
	II	IV		long slant
	IV	II		short slant
	I	IV		long slant
	IV	I		short slant

That is, in this experiment the difficulty of attaining the intended contrary pattern increases unequivocally from IV through II to [I and III]. Thus, the greater the differences in distance, the more strongly the factor of proximity operates.

[43] For initial experiments it is naturally good to begin with large step-by-step differences, but with a bit of practice in consistency of approach, it is quite possible to transition to series with more finely graduated steps.

Only in the cases of I → III and III → I did a large scattering occur, with no unequivocal result. But these are cases which in themselves are already very hard to get in the contrary pattern; and the two cases are objectively, quantitatively much more like one another than the other pairs.

Thus not only is the contrary pattern more difficult than the natural grouping, but also under the conditions of this experiment the difficulty of the contrary grows with the difference between the two distances. This is valid to a large extent, but—and this is of considerable importance for theory—it is not simply valid in general (cf. §47).

46. Among other methods that make a quantitative exploration possible, let us mention only the following.

Generate tables of systematic variations of an initial series, as in §21. The series are observed individually, switching from one to the next according to beats of a metronome, in systematic succession from the top, from the bottom, or from the middle. Look for the place where the "toppling over" occurs, that is, a sudden change into the other pattern or

into a jumble, while attempting to retain the originally grasped natural grouping, or while attempting to retain the artificially generated contrary grouping when going from the middle. With pure experimental conditions, the region of the toppling over exhibits sufficient consistency and thus produces a quantitative criterion.

Now vary different aspects and compare the outcome of different tables. For instance, one table might contain systematically varied series as in §21 with a constant $d_1 + d_2$, thus with a constant specific distance of the *a-c-e-f*... dots in the straight rows of dots. Now generate other tables with a different specific $d_1 + d_2$ distance, and vary that systematically. Also proceed with tables of series that have a constant d_1 and a varied d_2 . Also vary the number of series between the same initial and final series in a table and, thus, the number of steps. A somewhat different procedure would be to present the systematic sequence not from the top to the bottom and vice versa, but rather the top, then the bottom, then the second from the top, the second from the bottom, etc., and conversely going outward from the middle.

Even though in such experiments the strength of the factor of proximity and that of the factor of set [*Einstellung*] are tested at the same time, nevertheless confronting the outcomes yields insights into the mode of operation of the law of proximity.

From the results of such experiments so far, it should only be noted briefly here that they seem to give rise to a functional formula for the law of proximity, in which the relationship of the distances plays a decisive role, but not entirely alone.

[p. 344] 47. One more point should still be emphasized. One might suppose that the contrary pattern would generally become easier if d_2 , larger in itself (in our simple example in §21), is decreased; *b c / d e / ...* would arise more easily, as the distance *b-c* grows smaller (relative to the still smaller *a-b*).

Start with an initial series of four pairs of dots horizontally. Give it a small d_1 and large d_2 , such as $d_1 = 2$ mm and $d_2 = 10$ mm. Set up variations that hold d_1 constant while decreasing d_2 in steps. For instance,

series I	$d_1 = 2$ mm, $d_2 = 10$ mm	
II	2	7
III	2	5
IV	2	4
V	2	$3\frac{1}{2}$

One might expect that the contrary pattern would become easier from I to V. But that is not the case, and in a very characteristic way: Though it goes quite well with I, most people can achieve the contrary pattern clearly and simultaneously across the whole field with IV and V only with difficulty, if at all. (Here one can usefully allot different numbers of series to different subjects.) The progression in this experiment often leads maximally to "jumbling" in the series or to a kind of impoverished evenness. And if the contrary is achieved at all, it is still much less clearly, specifically, distinctly, plainly there than with I. This points to something fundamental; we will come back to it.

48. One can replace the dots in the series of §1, and similarly in other series, with

A. Several dots closely one above the other (series of vertical rows of dots);

B. Vertical lines;

C. Additional horizontal rows of dots going through the top and bottom of configuration A, closing it off; and corresponding continuous horizontal lines at the top and bottom of configuration B.

Here too the factors discussed above are effective in principle: the factor of similarity,²¹ and likewise the factor of proximity, as can easily be tested.

For instance,

Series A five pairs of dots, $d_1 = 5$ mm, $d_2 = 15$ mm

Series B at the same distances, vertical lines, say, 20 mm high

Series C the same series as B, but with a continuous horizontal line at the top and bottom of the verticals' ends.

But if one compares the result and the generation of the contrary pattern in these cases with the simple series of dots, the "contrary pattern" */ b c / d e / ...* appears much more easily, more specifically, more distinctly, more surely in B and C than in A. (Here again one can try allotting different numbers of series and different distances to different subjects.) Also, in cases where generation of the contrary in A is already very difficult, indeed is impossible to achieve across the whole field under the existing conditions, this grouping arises incomparably more easily in C or

21. Besides, it is easy to see here that the law of similarity is a special case: not only identical items but also those that lie symmetrically to one another, are correspondingly different, or the like are favored.

B. It looks "very salient [*prägnant*]," often arises remarkably suddenly ("with a snap"), and indeed results spontaneously under specific, characteristic, objective circumstances, and even is favored over $a/b/c/d/\dots$ or at least achieved more easily.

It was very easy to make the contrary grouping actually impossible with the simple groups of dots discussed. If one wants to do the same here, one must try very forceful configurations. Indeed with some subjects one must set up the factor of similarity, of the simple Gestalt, in the same time, in the same way.

Why is this? What is happening here?

If one does such experiments, one quickly sees that although posing the question in the form of $a/b/c/d/e/\dots$ as against $b/c/d/e/f/\dots$ was quite suitable to begin with, at bottom it was actually only a meager abstraction.

49. What do the groupings of §48 really look like? Does one truly describe the essence of what is obviously clearly presented if one speaks of " $a/b/c/d/\dots$ " and " $a/b/c/d/e/\dots$ "? In all these cases, are we really dealing with "sequences" or "quantities" of the pieces $a, b, c, d/\dots$ in a particular "combining of pairs"?

Let us start with C. What does the contrary, the pattern $a/b/c/d/e/\dots$ actually look like? Typically, like this: There is a long horizontal oblong with four wide vertical strips or vertical oblongs. The pattern $a/b/c/d/\dots$ is five narrow vertical strips between two parallel horizontals, and likewise with other forms.

And in B? Here too, with the contrary, there are typically four wide vertical strips between two bordering lines; and—are the two bordering lines really just "leftovers," "unpaired"? No; together they shape "the border." And here again $a/b/c/d/\dots$ are the five narrow strips.

And A? Even if it is not as saliently [*prägnant*] markedly there, nevertheless here too there is initially the articulated horizontal series with partitions (subgroups). With a successful contrary, here too again it is not simply that the first and last dots are "unpaired" or "left over." Rather, the four long ranges are between the two, which again shape "the border." And the grouping $a/b/c/d/\dots$ typically does not yield pairings of two pieces each or the like, but rather here too a horizontal whole with (small) subforms, subwholes.

In C very often there are not mere contour figures, but rather oblong surfaces, strips of surface. It is imperative to distinguish between these [p. 346] two forms. There are specific regularities, to be dealt with later, for result-

ing in one or the other: pure contour figure or actual surface figure (cf. Fuchs, loc. cit.). These are regularities in simultaneous ϕ forms of line and surface.

For people with a strongly visual disposition, the same thing is also clearly the case with A and with B. Thereby there often occur in B the characteristic border events of the generated strips of surface mentioned by Köhler.

Very striking events of this kind appear in the experiments mentioned in footnote 7. People with a very strongly visual disposition see characteristic, regular events. The "surface" stretches as if it is elastic. Thereby the subjective border curves change in a regular way above and below; the "surface" tears and disappears; a new, different one forms; and so on.

It is the same with A as well. For visually disposed people, the pattern $a/b/c/d/\dots$ does not contain just " a and b " as a simple pair. The space between a and b is not simply empty, "merely space between," the way the space between b and c is.²² Also "subjective lines" often crop up.²³

From here there is a very characteristic connection to outcomes of tachistoscopic experiments, even for people who are not visually disposed. In experiments with heterogeneous dot configurations at brief exposures at distances that in themselves are well above threshold, preferably with configurations that are more profuse and not merely individually linear, it appears very plainly²⁴ that typically the relationships are initially grasped as an overall whole. Subwholes of greater range become prominent, with their subdivisions unclear. Often, indeed, subwholes consisting of relatively closely spaced dots do not in the least appear simply as configurations of these and those dots. Rather, their common surface becomes prominent, without subarticulation at first, often as "overall an irregularly colored, dark domain." Everything seems to point to this: We are not dealing here with a principle that makes its appeal primarily to distances and relationships between the individual pieces. Rather, it is primarily a matter of the resulting of whole forms and of articulation into subwholes. It works not "from the bottom up," not from the individual pieces step by step to higher forms, but the other way around.

22. Cf. "dead interval"; but even for that it is so simple.

23. These lines are not merely straight, but also variously curved, according to the objective circumstances.

24. Except with unnaturally practiced setting [*Einstellung*] of the attention on a small range, which leads to poor recognition anyway.

In the present cases one might want to ask further: More precisely how are the "lines" as well as the "surfaces" there?

In C, if one saliently [*prägnant*] has the contrary version, with the four wide oblong surfaces, what do the five narrow interstitial spaces look like? Are they "five interstitial spaces"? No; typically there is just one field, one surface, whether it happens to be the surface of a horizontal whole long oblong or the surface of the paper. It is one continuous surface; or at the least it is not the "interstitial spaces" that are bordered by the lines so much as the strips between *b* and *c*, etc. The vertical lines have a one-sided bordering function. Line *b* very specifically acts as a border to the left, but not so much so to the right.²⁵

This can be shown experimentally with extreme rigor. With suitable designs, the figural form of the interstitial spaces is not seen as such in the least, to the point where one is often "blind" even to very familiar forms of such surfaces. One cannot find them at all when asked to do so, and does not recognize them—unless indeed one topples into the opposite pattern, here *b c*, much as with puzzle pictures.

Hence one has not in the least to do with pieces (and so still less simply with pairs) and interstitial spaces, but rather with surfaces within a surface. One extremely important special case of a surface Gestalt within a surface Gestalt is the case of a background with a figure on it. For these relationships and their consequences there are clear regularities.²⁶ It remains only to mention briefly that similar phenomena also occur in nonvisual domains, for instance, in the acoustic.

Here we can usefully supplement our three cases at the beginning of §48 with a fourth: We change C, not by putting more lines in a homogeneous field, but by making the strips *a b*, *b c*, . . . alternately different-colored surfaces, such as blue and yellow. And hereby we seem to have arrived at the case that is, theoretically, the most fundamental, if in doing so we also bring the whole visual field into consideration.

X [The *Ganzfeld*, and further observations]

50. We will go into the more detailed regularities of the last-mentioned circumstances only later. Here we just want to attempt a brief sketch of what seems to matter fundamentally overall for the key point in §49. In §§35 and 47f., among others, something came up that speaks against a theory of working primarily outward from the individual dots, the indi-

vidual distances that are juxtaposed. (We will later come to know something else that is still more important for this.) If one surveys the situation, p. 148] then a different kind of theoretical formulation proves to be more appropriate. What seems to matter in essence is sketched here in very preliminary propositions.

If we take a good look at salient [*prägnant*] cases of the kind last discussed, the following theses arise:

1. Certain stimulus distinctions (inhomogeneities) are required in a homogeneous field for it to divide up in some particular way, for some particular forms to crop up in it somehow and stand out in it.

A homogeneous field appears as a whole field [*Ganzfeld*]. It resists disintegration or tearing up or disruption. Relatively strong inhomogeneities are necessary for this, and are especially disposed to be favored for it.

This holds good not only for homogeneous fields, but also for fields that display a simple regular progression (for instance, centrally symmetrical) of brightness or the like. To some extent it holds for fields that appear inhomogeneous in a variegated irregular way, as a disorderly, mottled, chaotic *Ganzfeld*.

Even in cases where the stimulus conditions only approximate this, there is generally a tendency to appear as a *Ganzfeld* in this way.

The same sort of thing happens with certain subwholes that regularly appear as whole surfaces or as "single surfaces" (simultaneous ϕ surfaces). This is especially easy to test in contrast with experimental conditions that produce "dual" results.

2. The most salient [*prägnant*] case of a form resulting in such a *Ganzfeld* occurs if a closed simple surface form in the homogeneous *Ganzfeld* is homogeneously differently colored. It is plainly different and favored: more compelling.

If this surface part is enclosed by the otherwise homogeneous *Ganzfeld*, then typically there does not result a duality of surface form and frame form. The contour of the enclosed field essentially has a bordering function only for the former. It does not demarcate the "ground" so much. In salient [*prägnant*] cases the ground "goes through."

As a rule, such a surface part results in a surface figure in or on the field surface,²⁷ as a complete part, a subwhole. But the same is also the case if this partial surface with its homogeneously different color is replaced by

25. Cf. Rubin, loc. cit. here and for the following discussion.

26. Cf. Rubin, Fuchs, loc. cit.

27. With certain cues, a rarer counterpart results in a "hole" in the surface.

[p. 349] a domain that stands out through its regularly simple distribution of brightness, or even one that has a more or less dense different coloring than the *Ganzfeld* only discontinuously. For the simplest case of this, replace a homogeneous black surface figure in a white field merely with discontinuous black dots in the surface figure, or a continuous black line in a white field with a series of dots. Such a form stands out above all as a whole whose domain, its location and span, is in the *Ganzfeld*.

3. What is indicated here is repeated, theoretically secondarily, within this part-whole. Discontinuities and the occurrence of subwholes and subdomains can be generated within the part domain, for instance, in a straight line of dots where denser subgroups of dots are sundered from one another by relatively greater distances. The characteristic partitioning of the whole into subparts "from the top down"²⁸ is theoretically primary here as well.

4. The factors in part VII, especially §35, are of essential significance for resulting in such forms and partitions from the top down. There we see the conditions for the emergence of regular, characteristic, simple events primarily in broad outlines. Several such distributions together simultaneously tend not toward a coordinated "and"-juxtaposition, but rather toward a hierarchy of fewer main forms or main stretches, except in the cases where, on the contrary, a jumbled *Ganzfeld* is produced.

5. Under natural conditions, distribution of attention, fixation, and the like tend to be secondarily determined by the relationships in the configuration as a whole, above all by the main partitions in broad outlines. In principle one must distinguish between arbitrary, artificially intended

28. This also has extensive epistemological consequences. The psyche and the psychophysical organism of sensory reception do not react primarily like a mirror or receptive camera apparatus which, upon sensing the individual stimuli, employs all kinds of operations on and among them to construct larger forms from the bottom up, via further complication based on the sensed "and"-sum of the individual impressions. Rather, what comes into question is primarily a type of overall partition in the sense of the factors in part VII. In contrast with the concept of a primarily piecemeal mechanical sensory apparatus, what emerges here is the concept of an apparatus (though already that word is not adequate for the situation in the least) which is as useful as possible for grasping internal necessities. At some point one should ponder, in contrast with a piecemeal mechanical apparatus, how to conceive of this apparatus in principle: one that is as well adapted as possible for grasping inner connections, parts, data, and qualities caused by an inner principle. One of the most direct possibilities arises if pieces are not sensed primarily as such to begin with at all, but rather the reception itself is already caused by characteristic whole relationships ("from the top down").

modes of attention and those demanded by the structure. Under certain circumstances, an artificially produced shift in the range of attention sets up new, different field conditions.

6. In going from the top down as sketched here, from the conditions of the whole down to the subwholes and parts, the individual parts ("elements") do not come under consideration primarily as pieces in an "and"-sum. Rather, from the outset they are parts of their whole.

From this there follows a principle for observing the situation, even in cases where at first it theoretically appears that the primary foundation lies in individual presentation of pieces in an "and"-sum, such as in some approaches in the visual domain, and in pure succession in the acoustic domain.

In the acoustic realm too there is much that corresponds with the above. As an example, consider a motif emerging out of a confusion ("Waldweben"), setting itself off from the background of an "accompaniment," even the phenomenal "breaking through the silence." In individual sequences of tones as well, a deeper investigation of their phenomenal nature shows a complete correspondence. The typical presentation of pieces is as parts.

Briefly, here is a tentative note about that.

Isn't there a huge distinction phenomenally between hearing the first three tones of a melody as such, in anticipation of what follows, as a beginning that flows and goes onward, and, by contrast, hearing the "ending," such that I have the three tones as a whole motif? Indeed, isn't this already so with the first tone, which is there as a starter or preparation (as the leading tone), or in some other way is different from the tonic? This is not something "tacked on," but rather the essential flesh and blood of what is there. If one really wants to grasp the nature of phenomenal presentation, it becomes evident that the individual tones in the melody are clearly, saliently [*prägnant*] presented as parts. If, before going farther, in the situation where one really cannot know in the least yet how or whether the melody continues, one seeks to grasp the nature of what is presented, then something beautifully characteristic occurs. The character of the tones is definitely not yet quite complete. The tones have a more indefinite, still unstable character (and what peculiar experiences occur if one performs this experiment in a pure form!). They are complete, firm, and definite only when the last one is there as the "closing tone," and hence everything becomes firm. Indeed, in various cases like this using the same objective stimuli, more precise experiments show that

* the intensities and even the pitch of the tones typically seem to differ on the basis of certain Gestalt regularities. Correspondingly in the visual realm, typically what is presented is there primarily as a part or as the whole. This last is also possible for so-called "elementary" parts; and the fact that a certain epistemological mind-set [*Einstellung*] views such a grasping of the elementary parts as the "scientifically primary obligation" may well explain in part the customary, principally piecemeal approach to everything psychological.

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Translated by Michael Wertheimer and K. W. Watkins

Synopsis of Max Wertheimer's 1923 Article

Viktor Sarris

What is indicated here can become more strictly precise only with further study. It is clear that certain problems in pure mathematics and in set theory must be considered, particularly the problem of attributes of the whole in contrast with mere regularity among pieces.

—Max Wertheimer (1923, p. 154)

Abstract

This article, affectionately known to researchers since its first publication as the "dot study" (*Punktarbeit*) for its numerous examples of dot patterns in various arrangements, helped to define a central problem in perception. For most of a century, researchers have asked how the differential stimulation of a mosaic of discrete sensory elements, such as light-sensitive cells (photoreceptors), is transformed into perceived units, figures, and wholes distinct from one another and from their background: What are the principles that govern perceptual organization? We do not notice that some receptor elements are more activated than others; we perceive objects in relation to one another in space. He describes his work on the Gestalt laws, or principles, of perceptual organization, performed mostly during the period 1911–1914 in Frankfurt. He shows how these principles generate emergent properties of form perception in vision (as well as in audition): (1) Wertheimer develops these principles not only for stationary stimulus patterns but also for dynamic events (e.g., motion perception and recognition of a melody). (2) His studies aim eventually at a quantitative theory, but they are worked out mostly on a qualitative basis. (3) The theoretical conclusions are based mainly on compelling demonstrations and phenomenological evidence, rather than on a firm body of systematic psychophysical data.