

TEN The Gestaltists

A Visual Illusion Gives Rise to a New Psychology

On a train speeding through central Germany late in the summer of 1910, a young psychologist named Max Wertheimer stared at the landscape, intrigued by an illusion millions have taken for granted but that he felt, at that moment, required an explanation. Distant telegraph poles, houses, and hilltops, though stationary, seemed to be speeding along with the train. Why?¹

The puzzle led him to think about another illusory motion—that produced by the stroboscope, a toy employing the same principle as motion pictures, which were just becoming popular. In both cases, the rapid exposure to the eye of a series of photographs taken at split-second intervals, or drawings showing the smallest of changes, created the impression of continuous motion.

The phenomenon, known for decades, had never been satisfactorily explained. Thomas Edison and others who had developed motion pictures in the 1890s were content to achieve the effect without understanding what caused it. But on the train that day Wertheimer had a sudden intuition about the answer. He had taken his doctorate at Würzburg, where, in defiance of Wundtian principles, a handful of psychologists had been using introspection to explore conscious thinking. It now occurred to him that the illusion of motion might be due to something happening not in the retina, as many psychologists thought, but in the mind, where some higher-level mental process supplied transitions between the successive pictures, thereby creating the perception of movement. He promptly lost

interest in the problem of the moving landscape and never returned to it.

At the time, Wertheimer, who had been doing research at the University of Vienna on the inability to read, was on his way to the Rhineland for a vacation. But his idea so excited him that he got off the train at Frankfurt to consult Professor Friedrich Schumann, an expert on perception with whom he had studied at the University of Berlin before going to Würzburg, and who had recently moved to the University of Frankfurt.

In town, Wertheimer bought a stroboscope at a toy store and spent the evening working with it in his hotel room. (A stroboscope is a scientific instrument for seeing moving parts, as in machinery, slowed down or stationary, but in the nineteenth century and early in the twentieth the term referred to a popular toy that created the impression of motion.) The stroboscope came with pictures of a horse and boy; at the right speed of operation the horse appeared to trot and the boy to walk. Wertheimer replaced the pictures with pieces of paper on which he alternately drew lines in two locations, parallel to each other. He found that

at one speed of operation he saw first one line and then the other in their different places; at another, both lines side by side; and at yet another, a single line *moving* from one position to another. He had a historic experiment and a theory of psychology in the making.

The next day Wertheimer called on Schumann at the university, told him what he had observed and what he guessed was the explanation, and asked his opinion. Schumann could cast no light on the matter but offered Wertheimer the use of his laboratory and equipment, including a new tachistoscope of his own design. With it a researcher, by regulating the speed of rotation of a wheel with slits in it, could expose a visual stimulus to the viewer for brief durations, and by using wheels with differently located slits and a prism could present the viewer with alternating images. The tachistoscope did with precision and control what the stroboscope did crudely.

Because Wertheimer would need volunteers to serve as experimental subjects, Schumann introduced him to one of his two assistants, Wolfgang Köhler, who shortly brought in the other assistant, Kurt Koffka.² They were somewhat

younger than Wertheimer (he was thirty, Köhler twenty-two, and Koffka twenty-four), but all three were interested in the higher-level mental phenomena that the New Psychology of the physiologists and the followers of Wundt ignored, and they hit it off at once. They were to be friends and co-workers for their entire lives.

Wertheimer, single and possessed of an independent income—his father had been director of a successful commercial school in Prague—could do as he pleased; what he pleased was to abandon his vacation plans and remain in Frankfurt for nearly half a year conducting a series of experiments, with Köhler, Koffka, and Koffka's wife serving as his subjects.

In his basic experiment, adapted from the hotel room try-out, Wertheimer alternately projected a three-centimeter horizontal line and another one about two centimeters below it. At a low rate of exposure, his volunteers (who did not know until much later what he was doing) all saw first one line and then the other; at a high rate of exposure, both lines simultaneously; and at

intermediate rates, a single line smoothly moving from the upper to the lower position and back again.³

In a variation, Wertheimer used a vertical line and a horizontal line. At the right speed his subjects saw one line rotating back and forth through 90 degrees. In another variation he used lights; these, at the critical speed, appeared to be a single light moving. In still others he used multiple lines, different colors, and different shapes, and in every case was able to produce the illusion of motion. Even after he told his three subjects what was happening, they could not make themselves *not* see the motion. Through still other variations, Wertheimer ruled out any possibility that the phenomenon was due to eye movements or retinal afterimages.

The illusion, he concluded, was a “psychic state of affairs,” which he called the ϕ phenomenon. The letter *phi*, he said, “designates something that exists outside the perceptions of *a* and *b*,” resulting from a “psychological short-circuit” in the brain.⁴ The ϕ phenomenon, he suggested, resulted from “a psychological short-circuit” in the brain between the two areas stimulated by the nerve

impulses coming from the retinal areas stimulated by *a* and *b*.

This physiological hypothesis did not stand up in later research; what did was Wertheimer's theory that the illusion of motion takes place not at the level of sensation, in the retina, but of perception, in the mind, where incoming discrete sensations are seen as an organized unity with a meaning of its own. Wertheimer called such an overall perception a *Gestalt*, a German word that means form, shape, or configuration but that he used to mean a set of sensations perceived as a meaningful whole.

Seemingly, he had spent months of work to explain a trivial illusion. In actuality, he and his co-workers had sown the seed of the Gestalt school of psychology, a movement that would enrich and broaden psychology both in Germany and the United States.*

The Rediscovery of the Mind

Wertheimer's theory that the mind adds structure and meaning to incoming sensations was distinctly out of step with the antimentalist psychology that had been dominant in Germany for nearly half a century and in America for a generation.

His theory was also out of step with the *Zeitgeist* of 1910, which centered on the transformation of life and thought by the physical sciences and technology. The electric light was radically altering nighttime in cities and even remote towns, the automobile was changing the habits of nations, airplanes were becoming capable of sustained flight (Louis Blériot had flown across the English Channel), Marie Curie had just isolated radium and polonium, Rutherford was working out his theory of atomic structure, Zeppelin passenger service had recently begun, and Lee De Forest had lately patented the radio tube. The New Psychology was in harmony with such developments; mentalist psychology seemed more than ever metaphysical, unscientific, and passé.

But for some years a number of psychologists had considered Wundtian psychology barren and confining

because it did not deal with complex forms of experience such as emotions, thinking, learning, and creativity—the most important aspects of human life. James, Galton, Binet, Freud, and the members of the Würzburg School, though they had dissimilar concerns, were all interested in and had been investigating phenomena that could be explained only in terms of higher mental processes.

In addition, other researchers had been turning up bits of evidence that perceptions are not identical with the sensations received by the retina or other sense organs but are the mind's interpretation of the data in those sensations.

As far back as 1890, Christian von Ehrenfels, an Austrian psychologist, pointed out that when a melody is transposed, every note is changed, yet we hear the very same melody. He explained that we recognize the sameness of relations among the parts of the whole—what he called the melody's *Gestaltqualität* or “form quality,” a crucial characteristic perceived by the mind, rather than the ears.

Ernst Mach, a physicist with an interest in psychology, noted in 1897 that when we see a circle at different angles, it seems circular to us even though it looks ellipsoidal to a camera, and that when we see a table from different angles, the image on the retina changes but the inner experience of seeing a table does not. The mind interprets the sensations to mean what it knows the object to be.

In 1906 Vittorio Benussi, experimenting with the famous Müller-Lyer illusion, in which two lines (the horizontal ones in the following illustration) look different in length although they are exactly the same, found that even when he told his subjects to concentrate on the horizontal lines, they could not make themselves ignore the whole figure; they could reduce the illusion but not eliminate it.

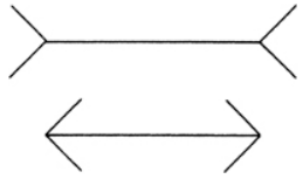


FIGURE 2
The Müller-Lyer illusion

And while Wertheimer was conducting his first experiment in Frankfurt, David Katz, a psychologist at Göttingen, was exploring the phenomena of “brightness constancy” and “color constancy.” When we see an object in shadow, he found, we perceive it as having the same brightness and color as when we see it in sunlight, even though objectively it is darker and its color different. We see it, that is, within a known context.

Wertheimer, Koffka, and Köhler had all been exposed to such findings and concepts in their training, and had all been influenced at Berlin by Carl Stumpf, who had imported phenomenology from philosophy into psychology. (In phenomenological psychology, the primary materials of research are everyday real-life experiences, not elemental sensations and feelings.) Wertheimer and Koffka had also studied at Würzburg, where the research emphasis was on thought processes. All

three, moreover, had done research involving higher mental functions: Wertheimer on the thinking of feeble-minded children and patients with reading disorders, Koffka in his dissertation on rhythmic Gestalten,* Köhler in his on the psychology of acoustics.

Still, they were a distinctly dissimilar threesome, and hardly looked like an intellectual attack force capable of assaulting and defeating Wundtian psychology.

Wertheimer, reared in Prague, was a Jew. Boyish of feature but balding, he sported a huge, martial, Bismarckian mustache but was poetic, musically gifted, warm, humorous, and cheerful. He was an exciting and fluent speaker; his ideas brimmed and bubbled over. But reining in his thoughts to set them down on paper was so difficult and painful for him that he was genuinely phobic about writing.

Koffka, a Berliner, was half Jewish. Small and frail, with a long, thin face and a somber look, he was introverted, sensitive, and insecure; inexplicably, these traits, though they made him an uninspiring lecturer, endeared him to his female students. Ill at ease at the

rostrum, he was comfortable at the writing table and produced systematic, scholarly expositions of the Gestalt psychology.

Köhler, a Gentile born in Estonia and reared in Wolfenbüttel, Germany, was hawk-featured, with a short, stiff thatch of hair parted in the middle. He was the most painstaking experimenter of the three, and later became a strong institute administrator. Arrogant, stiff, and formal in person—he had to know someone socially for ten years before he would use the personal *du* instead of the formal *Sie*—in his writing he could be surprisingly relaxed and charming.

In the end, the differences among the three produced an advantageous specialization of function. As one history of the Gestalt movement puts it, Wertheimer was “the intellectual father, thinker, and innovator,” Koffka “the salesman of the group,” and Köhler “the inside man, the doer.”⁵

But only one of the three ever held a major position in the psychological establishment. Wertheimer, his way impeded by anti-Semitism and his limited output of

publications, was for years merely a lecturer, and later a Professor Extraordinarius at the University of Berlin. Not until 1929, when he was forty-nine, did he finally become a full professor (at Frankfurt), only to have to flee abruptly four years later when the Nazis came to power. He emigrated to the United States, where he taught at the New School for Social Research but never held a major chair in psychology.

In Germany, Koffka rose only to the rank of Professor Extraordinarius at the University of Giessen. He gave a series of lectures in America and in 1927 obtained a full professorship at Smith College—not a center of psychological research—and remained there for the rest of his life.

Köhler alone achieved major status in Germany. After several years of teaching and over six years of brilliant experimental work in the Canary Islands, in 1921 he was appointed head of the Psychological Institute at the University of Berlin—the premier post in German psychology—at the age of thirty-four, and made it a center of Gestalt studies. But he held the post only fourteen years;

in 1935, after courageously but vainly struggling to keep Nazi influence out of the institute, he resigned, came to America, and spent the rest of his career at Swarthmore College.

Yet even before Köhler rose to his high position at Berlin, the three young men, in only ten years, breached the defenses of Wundtian psychology and established the legitimacy of their new mentalism—a psychology of the mind based on demonstrations and experimental evidence rather than on rationalist arguments and metaphysical speculations.

Although they published relatively little in that time (partly because of the disruptions of World War I), it was enough to show that Gestalt theory offered a better explanation than earlier cognitive psychologies of both perception and higher mental functions. Their evidence was so striking and their arguments so plausible that by 1921 Gestalt psychology had begun to supplant Wundtian psychology, as evidenced by Köhler's appointment.⁶

Until the mid-1930s, Gestaltism was a major force in German psychology and a growing one in many other

countries. It had only limited effect on American psychology before the arrival of the triumvirate between 1927 and 1935. Then, although none of the men held a leading position in the American psychological establishment, their ideas infiltrated psychological thinking and slowly began to expand it beyond the confines of behaviorism.

The Laws of Gestalten

From the outset, Wertheimer saw Gestalt theory as far more than an explanation of perception; he believed it would prove to be the key to learning, motivation, and thinking.

He based this view not only on the odds and ends of evidence offered by the predecessors of Gestalt theory but on some early research of his own. Shortly after his Frankfurt work on the illusion of motion, he was asked by the director of the children's clinic at the Psychiatric

Institute of Vienna to find ways of teaching deaf-mute children. One method he experimented with consisted of his building a simple bridge with three wooden blocks while a deaf-mute child watched, and then dismantling it. The child would then try it, and usually, after one or two mistakes, would catch on and successfully build a number of bridges of different shapes and sizes. The child's thinking, it appeared to Wertheimer, was based not on the number and size of the items used in the demonstration but on the perception of a stable configuration—a Gestalt—in which both uprights are of the same length and are positioned toward the ends of the horizontal piece.⁷

Wertheimer also read anthropological reports of numerical thinking by primitive peoples and wrote a paper on it in 1912. Speakers of certain South Sea languages, he learned, have different ways of counting fruit, money, animals, and men; each way represented a Gestalt appropriate to the item. He also discovered that people who lack our abstract system of grouping and numbering use natural groupings as numerical thinking. A primitive man about to build a hut might not count the number of

vertical posts needed but would know without counting what the hut's framework should look like and, thus, how many posts to seek.⁸

Using these data plus his experiments at Frankfurt, Wertheimer drew up the outlines of a new psychology in a 1913 series of lectures. The central doctrine was that our mental operations consist chiefly of Gestalten rather than strings of associated sensations and impressions, as followers of Wundt and associationists believed. A Gestalt, he said, was not a mere accumulation of associated bits but a structure with an identity; it was different from and more than the sum of its parts. The acquisition of knowledge often took place through a process of “centering” or structuring and thereby seeing things as an orderly whole.⁹

Although Wertheimer envisioned Gestalt theory as the basis of an entire psychology, much of his research and more than half the research of all Gestalt psychologists in the early years dealt with perception.^{*10} Within a dozen years the three leading Gestaltists, their students, and several other Gestalt-oriented psychologists had

Proximity: When we see a number of similar objects, we tend to perceive them as groups or sets of those which are close to each other. Wertheimer's simple demonstration:

• • • • • • • • • • • • • •
[a b c d e f g h i j k l m n]

The Law of Proximity: a simple case

People shown the line of dots, he found, spontaneously see it as pairs of dots close to each other (ab/cd/ ...), and while it could also be construed as pairs of widely spaced dots

with little room between the pairs (a/bc/de/ ...), no one sees it that way, and most people cannot even make themselves do so. A more striking example:

The Law of Proximity: a more extreme case

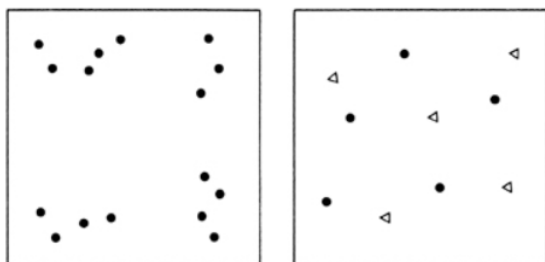
Here one sees lines made up of three closely spaced dots, tilted slightly to the right of the vertical; one does not see, and can see only with difficulty, an alternative structure—lines made up of three widely spaced dots, tilted far to the left of the vertical.

Similarity: When similar and dissimilar objects are mingled, we see the similar ones as groups:

○ ○ ● ● ○ ○ ● ● ○ ○ ● ● ○ ○ ● ● ○ ○ ● ● ○ ○ ● ●

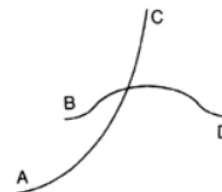
The Law of Similarity: a simple example

The similarity factor can, in fact, overcome the proximity factor. In the left-hand box below, we tend to see four groups of closely spaced objects; in the right-hand box, two sets of dispersed but similar objects.



The Law of Similarity: a more complex example

Continuation or direction: In many patterns, we tend to see lines that have a coherent continuation or direction; this is why we are able to pick out a meaningful shape from a bewildering background, as we do in “hidden figure” puzzles. Such a line or shape is a “good Gestalt”—one with inner coherence or inner necessity. In this pattern, for instance, we can force ourselves to see two curved pointed figures, AB and CD, but what we tend to see is the more natural Gestalt of two intersecting curves, AC and BD. The factor of continuation can be astonishingly powerful. Consider these figures—



The Law of Continuation: two curves or two pointed shapes?

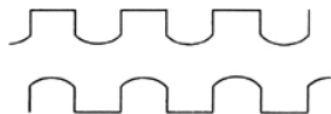


FIGURE 8

Two figures, easily seen as distinct

and now this one, a merger of the previous two:



FIGURE 9

The same figures, now visually inseparable

It is virtually impossible to see the originals in the merged figure because of the dominance of the continuous wavy line.

Prägnanz: The related English word “pregnancy” does not convey Wertheimer’s meaning, which is “the tendency to see the simplest shape.” Much as physical laws cause a soap bubble to assume the simplest possible shape, so the mind tends to see the simplest Gestalten in complex patterns. This figure



FIGURE 10

The Law of Prägnanz: We see the simplest possible shapes.

could be interpreted as an ellipse with a right-angled segment cut out of the right side of it touching a rectangle with a curved chunk cut out of the left side of it. But that is not what we see; we see the far simpler image of a whole ellipse and a whole rectangle overlapping.

Closure: This is a special and important case of the Law of *Prägnanz*. When we see a familiar or coherent pattern with some missing parts, we fill them in and perceive the simplest and best Gestalt. We see this as a star instead of the five V's that make it up.



FIGURE 11

The Law of Closure: We supply what is missing.

In the 1920s, the Gestalt psychologist Kurt Lewin noticed that a waiter could easily remember the details of a customer's bill if it had not yet been paid, but as soon as it was paid he forgot the details. It occurred to him that this

was an instance of closure in the area of memory and motivation. As long as the transaction was incomplete, it lacked closure and generated tension, maintaining memory, but as soon as closure was achieved, the tension and the memory disappeared.¹³

A student of Lewin's, a Russian psychologist named Bluma Zeigarnik, put his conjecture to the test in a well-known experiment. She assigned a number of volunteers a series of simple tasks—making clay figures, solving arithmetic problems—allowing them to complete some of the tasks but interrupting them during others on a pretext and not letting them finish the work. A few hours later, when she asked them to recall the tasks, they remembered the uncompleted ones about twice as well as the completed ones, confirming Lewin's guess.¹⁴ The study made her famous, in a small way; to this day, psychologists writing about motivation refer to the “Zeigarnik effect.”

Figure-ground perception: When we pay attention to an object, we see little or nothing of the background; we see the face we are looking at, not the room or landscape beyond it. In 1915 Edgar Rubin, a psychologist at the

University of Göttingen, explored this “figure-ground” phenomenon—the mind’s ability to focus attention on a meaningful pattern and ignore the rest of the data. He used a number of test patterns, one of which, the so-called Rubin vase, is familiar to almost everyone:

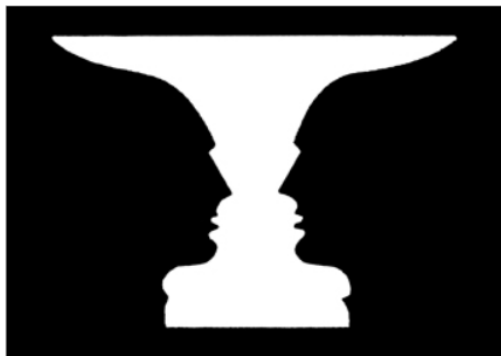


FIGURE 12
The Rubin vase: Pottery or profiles?

If you look at the vase, you do not see the background; if you look at the background—two faces in profile—you do not see the vase. Moreover, you can *will* yourself to see whichever you choose; will apparently does exist, in spite of the New Psychologists and the behaviorists.

Size constancy: An object of known size, when far off, projects a tiny image on the retina, yet we sense its real size. How do we manage that? Associationists said that we learn from experience that remote objects look small and pale, and we associate these clues with distance. Gestaltists found this explanation simplistic and contrary to new evidence. Very young chicks were trained to peck only at larger grains of feed. When the habit was firmly established, the larger grains were put at a distance, where they looked smaller than the nearby small grains, but the chicks unhesitatingly went for the larger ones. An eleven-month-old baby girl was trained (by means of a reward) to choose the larger of two side-by-side boxes. The larger box was then moved far enough away for its retinal image to be only 1/15 the area of the smaller box, but she still chose it.¹⁵

We sense that distant objects are as large as when they are near because of the mind's organization of data in terms of relationships—to adjoining known objects, for instance, or to perspective-giving features.¹⁶ The two illustrations in Figure 13, from a relatively recent textbook of perception, make the point:



FIGURE 13

Perspective gives clues to size.

In the left-hand panel, the relationship of the farther man to things near him and to the hallway enables us to

perceive him as being as large as the nearer man. Yet on one's retina the image of the farther man is very much smaller, as the right-hand panel shows.

Out-of-Reach Bananas and Other Problems

Sultan, a male chimpanzee living in an anthropoid research center, has had nothing to eat all morning and he is hungry. His keeper lets him into a room where a bunch of bananas is hanging from the ceiling, out of reach. Sultan jumps toward the bananas a few times but comes nowhere near them. He then prowls around the cage, making discontented sounds. Some distance from where the bananas are hanging he comes upon a short stick and a large wooden box. He picks up the stick and tries to knock the bananas down, but they are too high. For a while, he bounces around, upset and angry; then, he suddenly rushes to the box, pulls it under the bananas, climbs up on it, and with a little jump seizes his prize.

Days later: The situation is the same except that now the bananas are hanging considerably higher. This time there is no stick, but there are two boxes, one larger than the other. Sultan knows what to do, or thinks he does. He drags the larger box under the bananas, climbs up, and crouches, as if to jump. But after looking up, he does not; the bananas are well beyond his range. He leaps down, seizes the smaller box, and, pulling it behind him, gallops around the room, shrieking in anger and kicking the walls. Plainly, he seized the second box not with the thought of putting it on the first one but merely to help vent his anger.

*But all at once he stops shrieking, pulls the smaller box over to the other one, with some difficulty hoists it on top of the larger one, and climbs up. He has solved the problem. Wolfgang Köhler, watching and making copious notes, is deeply pleased.*¹⁷

Köhler conducted a series of studies of chimpanzee mentality between 1914 and 1920 that became almost as famous as Pavlov's experiments with the salivating dog

and Watson's with little Albert. Not only were Köhler's findings valuable in themselves but they led directly to similar studies of human problem solving by Gestalt psychologists that produced a number of significant discoveries.

The nature of the thinking involved in problem solving had interested philosophers and psychologists for much of the previous twenty-four centuries, but in Germany the subject had been out of fashion for some time. Like all higher-level mental processes, it lay outside the boundaries of scientific psychology as defined by the physiological psychologists and the Wundtians. In America, although William James and John Dewey had written about problem solving, Thorndike's puzzle box experiments with cats had led many psychologists to regard it as the result of trial-and-error activity, even in human beings, rather than of conscious planning and problem solving.

Wertheimer, who in his formative years had read and admired Spinoza, took a different view: he believed in the power of the thinking mind. He was impressed, too, by the statements of Galileo and other great discoverers

indicating that their breakthroughs often came from a new view of the problem that produced a sudden insight.

To illustrate how such a perception can produce a solution, Wertheimer liked to tell a little anecdote about Karl Gauss, the famous mathematician. When Gauss was six years old, his teacher asked the class who could first give the total of $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10$. In seconds young Gauss raised his hand. “How did you get it so quickly?” the teacher asked. Gauss said, “If I had to add one and two and three, and so on, it would have taken a long time, but one and ten are eleven, two and nine are eleven, three and eight are eleven, and so on— five elevens in all. The answer is fifty-five.” He had seen a structure that led instantly to a solution of the problem.¹⁸

Wertheimer was interested all his life in reasoning and problem solving, and in his last years wrote *Productive Thinking* (1945), a general discussion of the subject as seen by Gestalt psychology. But other Gestaltists, Köhler leading the way, did the bulk of the experimental work on the matter.

Köhler, after working with Wertheimer on the motion-illusion experiments, had stayed on at Frankfurt for another three years; then, at twenty-six, he was offered the post of director of the Prussian Academy of Sciences’ anthropoid research station on Tenerife, one of the Canary Islands, a Spanish possession off the coast of northwest Africa. Köhler shipped out in 1913, never imagining that a world war and chaotic post-war conditions in Germany would trap him there for over six years.

But he put the time to good use. He had been profoundly impressed by Wertheimer’s ideas and, as he later recalled, “had a feeling that his work might transform psychology, which was hardly a fascinating affair at the time, into a most lively study of basic human issues.”¹⁹ During his years on Tenerife these ideas were often on his mind, and his primate studies, although not formally couched in Gestalt terms, strikingly confirmed Gestalt theory as applied to problem solving. He pursued the investigation, with numerous variations and replications, for a number of years. Several British intelligence agents were convinced that he was a German spy, since no

scientist would have spent so much time studying how apes get hard-to-reach bananas.²⁰

(Ronald Ley, a psychologist at the State University of New York at Albany, recently spent nearly fifteen years trying to determine whether Köhler had been a spy. He gathered gossip and rumors from elderly Tenerifans, but neither on the island nor in Germany did he find any hard evidence bearing on the matter. Ley thinks Köhler may well have been a spy; other scholars doubt it.)

Köhler created a number of different problems for his apes to solve. The simplest were detour problems, in which the chimpanzees had to get to the bananas by a roundabout route; that gave them no trouble. More complicated were problems in which the chimpanzees had to use “tools” to reach bananas hanging out of reach—sticks with which they could knock them down, ladders they could lean against a wall (they never did figure out how to prop the ladders securely but always stood them sideways to the wall), and boxes.

Some of the chimpanzees took a long time to see that the boxes could be used to reach the bananas, and they

never did use them well. Some would do ineffective things like piling up boxes where they happened to be rather than under the bananas, or stacking them so poorly that they toppled over when the chimpanzees tried to climb on them. Others, clearly smarter, did better, learning to stack boxes in a more secure fashion even when it took more than two boxes for them to reach the bananas. Grande, a female, actually was able, albeit with difficulty, to build a stack of four boxes when necessary.

Time and again, an ape would seem to suddenly see a solution at some juncture; Köhler interpreted this as a restructuring of the ape’s view of the situation. He called the sudden discovery “insight,” and defined it as “the appearance of a complete solution with reference to the whole layout of the problem,”²¹ obviously quite a different process from the trial-and-error learning of Thorndike’s cats.

Köhler thought the cats might have exhibited insight in a different kind of situation, but the puzzle box was a problem they could not solve through intelligence because it contained mechanical elements they could not see. But

he did determine that insight thinking does not take place in simpler animals. He set up a fence at right angles to the wall of a house, with a segment at a right angle to its outer end, making an L. When he put a chicken inside the L and food outside, the chicken rushed back and forth along the fence, unable to recognize that by momentarily turning away from the food it could get around the end of the barrier. A dog, however, quickly sized up the situation and ran around to the food. A one-year-old girl, put inside the L and seeing her favorite doll on the other side, first tried to push through the fence but then laughed joyfully and toddled around the corner to it.²²

With chimpanzees, some of the most dramatic instances of insight were elicited by another problem. Köhler would put an ape in a cage and a bunch of bananas outside, out of reach. In the cage would be several sticks; a chimpanzee might not realize for some time that it could reach the bananas with a stick but then all at once see that it could. A female chimpanzee, Tschego, first tried to reach the bananas with her hands and after half an hour got discouraged and lay down. But when a few other

chimpanzees came into view outside the cage, she leaped to her feet, seized a stick, and deftly pulled the bananas within reach. Apparently the sight of other apes nearing the food served as motivation and produced the click of insight.

In another stick problem, the moment of illumination was even more dramatic. Köhler's account of it:

Sultan cannot reach the fruit, which lies outside, by means of his only available short stick. A longer stick is deposited outside the bars. [It] cannot be grasped with the hand, but it can be pulled within reach by means of the small stick. Sultan tries to reach the fruit with the smaller of the two sticks. Not succeeding, he tears at a piece of wire that projects from the netting of his cage, but that too is in vain. Then he gazes about him (there are always in the course of these tests some long pauses, during which the animals scrutinize the whole visible area). He suddenly picks up the little stick once more, goes up to the bars directly opposite the long stick, scratches it toward him with the "auxiliary," seizes it, and goes with it to

the point opposite the objective, which he secures.²³

In an even more complicated problem, the bananas lay beyond reach with either of two available sticks; one of them, however, was thinner than the other and could be pushed into the thick one to combine their lengths. Even clever Sultan did not quickly see this solution. He spent about an hour trying to reach the fruit, to no avail; Köhler gave him a hint by sticking one of his own fingers into the end of a stick, but Sultan did not get the idea. Then:

Sultan squats indifferently on a box, which has been left standing a little back from the bars; then he gets up, picks up the two sticks, sits down again on the box, and plays carelessly with them. While doing this it happens that he finds himself holding one rod in either hand in such a way that they lie in a straight line. He pushes the thinner one a little way into the opening of the thicker, jumps up and is already on a run toward the bars, to which he had up to now half turned his back,

and begins to draw a banana toward him with the double stick.²⁴

One of Köhler's most important findings, with sweeping implications for the psychology of learning, was that insight learning does not depend on rewards, as did the stimulus-response learning of Thorndike's cats. The chimpanzees were, of course, seeking a reward, but their learning was not brought about by the reward; they solved the problem before eating the fruit.²⁵

Another important finding was that when animals achieved an insight, they learned more than the solution to that particular problem; they were able to generalize and apply the solution in modified form to different problems.²⁶ In psychological terms, insight learning is capable of "positive transfer"; in lay terms, the chimpanzees became test-wise.

Köhler reported his findings in a monograph in 1917 and in a book, *The Mentality of Apes*, in 1921. Both monograph and book made a considerable impression in the world of psychology, and not only as a study of animal

problem solving; Köhler's observations prepared the way for Gestaltist studies, using the same techniques, of human problem solving.

In 1928, a psychologist at Teachers College, Columbia University, used Köhler-type situations with children ranging in age from a year and a half to four years. Instead of bananas, the desirable objects were toys, which she placed out of reach, either outside the bars of a playpen or on a shelf. Sticks were available in the playpen experiment, and a chair and a box for the shelf. Sometimes the children showed immediate insight, and sometimes saw the solution only after a certain amount of fumbling around. The process was remarkably similar to what had taken place in the apes' minds, although, not surprisingly, even these immature human beings were more insightful than the mature chimpanzees.²⁷

Similar experiments with eight still younger children, ranging in age from eight to thirteen months, were conducted a little later by a young German psychologist, Karl Duncker, who had studied with both Wertheimer and Köhler at Berlin. He used a simple problem situation. The

children sat at a table on which an attractive toy lay beyond reach; a stick was at hand. Only two children had insight almost at once; five others played with the stick until they either deliberately or accidentally moved it close to the toy, at which point they abruptly perceived the stick as a retrieval implement. The youngest child never solved the problem.²⁸

Duncker's more important work involved a series of problem-solving studies conducted between 1926 and 1935 with adult subjects. One of his research methods was to present a problem and ask the subject to think out loud as he tried to solve it; Duncker recorded what was said and then analyzed his "protocol" or written record to see how the subject formulated the problem and searched for a solution. This was one of the two problems:

Given a human being with an inoperable stomach tumor, and rays which destroy organic tissue at sufficient intensity, by what procedure can one free him of the tumor by these rays and at the

same time avoid destroying the healthy tissue which surrounds it?²⁹

A typical subject's protocol (excerpted and much abbreviated here) read like this:

Send rays through the esophagus.

Expose the tumor by operating.

One ought to decrease the intensity of the rays on their way; for example—would this work?—turn the rays on at full strength only after the tumor has been reached.

Either the rays must enter the body or the tumor must come out. Perhaps one could alter the location of the tumor—but how?

Through pressure? No.

The intensity ought to be variable.

Adapt the healthy tissues by previous weak application of the rays.

I see no more than two possibilities: either to protect the body or to make the rays harmless.

(Experimenter: How could one decrease the intensity of the rays en route [as you suggested

earlier]?)

*Somehow divert... diffuse rays... disperse... stop! Send a broad and weak bundle of rays through a lens in such a way that the tumor lies at the focal point and thus receives intensive radiation.*³⁰

This protocol and others showed that when faced with such a problem, people use a number of different heuristic (exploratory) techniques. Most often they start with mechanical or routine heuristics, such as trying random possibilities based on the most immediate or obvious characteristics of the problem; such heuristics usually yield poor solutions or none. In the above protocol, sending rays through the esophagus or exposing the tumor by operating are efforts of this kind.

Eventually, after reaching a number of dead ends, many subjects get around to more productive “functional” heuristics (a few others use them from the outset), such as trying to identify the essential properties of the problem. They ask themselves, for instance, what the fundamental goal is, and only then do they look for a specific solution.

In the above protocol, the subject began thinking this way when he said, “One ought to decrease the intensity of the rays on their way.” He then reverted to the first kind of thinking (“Perhaps one could alter the location of the tumor”), but after the experimenter reminded him of his more basic heuristic he suddenly had his dramatic insight into a feasible solution. The mechanical heuristics are analogous to the chicken’s running back and forth along the fence, the functional heuristics to looking at the situation in broad perspective and seeing a less direct but effective way of reaching the goal.

Duncker’s other principal research method was to bring a subject into a room where a jumbled array of objects and materials lay on a table and then ask him to perform a task for which none of the objects seemed suitable. The goal was to see under what conditions the subject would weigh other possible uses of one or more of the available objects and under what conditions such restructuring was inhibited.

In one situation, for instance, the subject was asked to mount three small candles on the door at eye level,

ostensibly for “visual experiments.” On the table were some candles, a few tacks, paper clips, pieces of paper, string, pencils, and some other objects, including the crucial ones: three small empty cardboard boxes. After fumbling around, every subject eventually restructured his view of the things at hand and saw that the boxes could be tacked to the door and used as little platforms to mount the candles on.

But in another version of the problem, the three boxes were filled, one with little candles, the second with tacks, and the third with matches. This time, fewer than half of Duncker’s subjects solved the problem. They had seen the boxes being used for a specific purpose, and that made it harder to see them as usable in an unboxlike way.³¹

Duncker called this common and serious impediment to problem solving “functional fixedness”; when a problem solver sees an object as having a specific function, it is far more difficult for him to see it as serving any other function.

This was a noteworthy discovery. It explains why so often the very people who know most about any subject

are the least likely to find a good solution to a new problem in their field. Education creates expertise but also functional fixedness. An expert sees the tools he has at hand in terms of the functions he knows they serve; a neophyte may, while coming up with uninformed and even absurd suggestions, see them more creatively. It is no accident that scientists generally make their most original and important contributions early in life.

Duncker, thought by many to have been the most brilliant of the Gestalt group in the 1930s, might have gone much farther with his investigation of problem solving had he not died tragically early. A political liberal, he fled from Germany in 1935 and went first to England and, in 1938, to the United States to teach at Swarthmore. In 1940, at thirty-seven, deeply depressed by the outbreak of war, he committed suicide.

The studies of problem solving by Köhler, Duncker, and other Gestalt psychologists look relatively simple but their implications were profound. They demonstrated that

problem solving in human beings (and to some extent in animals) is not limited to trial and error and to conditioned responses but often involves certain kinds of higher-level thinking that produce new vision, thoughts, and solutions. The studies of problem solving were one of the most important ways in which the Gestaltists restored mind as the central concern of psychology.

Learning

For many centuries the study of how knowledge is acquired had been one of the chief interests of psychologist-philosophers and psychologists. But with the advent of the physiologist-psychologists and Wundt, most of it was stored in the attic of culture with other obsolete mentalist topics.

What little the physiologists and followers of Wundt said about learning was mostly secondhand associationism; they saw it as merely the linking or joining

Zobrazit plochu

of bits of experience. The behaviorists made learning the central topic of their research—but only the mindless learning of SR conditioning; the higher-level mental processes involved in much human learning were ignored in favor of such calculations as the relationship between the number of reinforced trials and the strength of the established habit.

Among the contributions of the Gestaltists, and perhaps their greatest, was the restoration of meaning and thought to the study of learning. Although the Gestalt movement flourished only briefly in Germany and did not replace behaviorism in the United States, it revived and renovated the cognitive tradition and prepared the way for the cognitive revolution of the 1960s.

It was not the human mind, however, but the mind of the hen that provided the first solid evidence that associationist and S-R theories of learning were seriously inadequate. Köhler, during his stay on Tenerife, conducted a tedious but enlightening experiment with four chickens. He allowed two of them to peck at grain scattered on a light gray square of paper but shooed them away whenever

they tried to peck at grain on a darker gray square of paper. He gave the other two chickens the opposite treatment. Chickens are notoriously stupid, but after four hundred to six hundred trials the first two would peck only at grain on the lighter paper and the second two only at grain on the darker paper.

Köhler then altered both situations. He kept the background color the chickens had been trained to eat from but replaced the other one, substituting a still lighter paper in the first case, a still darker one in the second. Associationist and S-R theory would predict that since the chickens had learned to associate eating with a particular shade of gray, they would continue to do so, but in 70 percent of the trials they pecked at grain on the new backgrounds rather than the old ones. The pair that had been trained to eat from the lighter of two backgrounds now mostly chose the new, still lighter background; the two who had been trained to peck at the darker of two backgrounds now mostly chose the new, still darker background. Gestalt theory offered an answer: The chickens had learned to associate food not with a specific



color but with a *relationship*— in one case the lighter, in the other case the darker, of two backgrounds.³²

Köhler repeated the experiment with chimpanzees and with a three-year-old child. He presented each with two boxes, one of a dull color, the other of a bright color. When a chimpanzee was the subject, the bright-colored box had a bit of food in it; when the child was the subject, a bit of candy. After the chimpanzee and the child learned that the bright box contained the reward, Köhler eliminated the dull box and substituted a new one, even brighter than the reward box. This time he put a reward in both boxes so that there was no incentive for the subjects to choose either except its color relationship to the other—and in fact the chimpanzees and the child usually chose the new, brighter box.

Behaviorists and Wundt's followers had known that an animal can be trained to choose one of two different-colored objects, but had refused to believe that what the animal learned was the relationship between the colors. To these "elementalist" psychologists, a relationship could not be a primary psychological fact. As Solomon Asch, a

student of Wertheimer's, observed, "This premise was sufficiently potent to blot out the ceaseless evidence of experience."³³

But Köhler's experiment showed conclusively that the relationship between the colors was indeed the primary fact the animals had learned, since they *transposed* it to a different situation.³⁴ It was an example of the general rule, said Asch, that animals and humans perceive and learn nearly everything in terms of relationships. This object stands on top of that one, is between two others, is bigger than, smaller than, earlier or later than another, and so on. Relations are the key to perception, learning, and memory. That truth had been excluded from psychology but was reinstated by the Gestaltists.

Wertheimer, Köhler, Koffka, and many of their students did research on learning, but much of the credit for promulgating their cognitive view of it goes to Koffka. That shy, self-doubting, homely little man with his odd, high-pitched voice was at his best when assembling facts and theory on paper; in print he could be masterful and scathing.

Koffka himself conducted no noteworthy research on learning; nearly all his experimental work was on the perception of depth, color, and motion. But because his English was excellent, the editor of the *Psychological Bulletin*, Robert M. Ogden (who had studied with Koffka at Würzburg), invited him to prepare the first account in English of Gestalt psychology. It appeared in 1922; from then on Koffka was the unofficial spokesman of the movement. Largely through his journal articles and two books, the research findings and ideas of the Gestaltists about learning became known to the profession.

In one of those books, *The Growth of the Mind*, published in German in 1921 and English in 1924, Koffka reviewed existing knowledge about mental development from a Gestaltist viewpoint. Of the many new ideas and interpretations he offered, two stand out.

The first: Instinctive behavior is not a chain of reflexive responses mechanically triggered by a stimulus; rather, it is a group or pattern of reflexes—a Gestalt imposed by the creature on its own actions—aimed at achieving a particular goal. A young chick pecks at certain things that

it “knows” are edible, but the instinct is goal-oriented, driven by hunger, not a mechanical and automatic response to the sight of food.³⁵ The chick does not peck when sated, despite the sight of food and the existence of the reflex.

The second: Against the behaviorist doctrine that all learning consists of chains of associations created by rewards, Koffka argued that much learning takes place through the processes of organization and reorganization in the mind in advance of reward; he offered as proof Köhler’s studies of problem solving by apes and comparable data on problem solving by children. But the exact cause of those organizing processes, he admitted, was not yet known.

Fourteen years later, in *Principles of Gestalt Psychology* (1935), a heroic attempt to review all existing knowledge of psychology from a Gestaltist viewpoint, Koffka was ready to offer a theory as to the cause of the organization and reorganization in the mind. The theory, elaborated from one originally proposed by Köhler, was that “psychophysical” forces inherent in the brain—neuronal energy fields—act like the force fields elsewhere in nature

that always seek the simplest or best-fitting configuration (as in, again, the bubble, or the lines of force in a magnetic field). Hence the mind's tendency to construct and reconstruct information in the form of "good Gestalten."³⁶

But are those good Gestalten faithful representations of the outside world? Koffka gave a resounding affirmative to this ancient question. He offered the theory, suggested by Wertheimer and developed by Köhler, that our thoughts about the world are *isomorphic* with the world itself—they are brain events that are, in some way, similar in structure to the external things they represent. If we see two separate lights, there are two separate areas of brain excitation; if we see movement, there is a corresponding movement in the field of arousal in the brain.³⁷ The contents of the mind are not something wholly unlike the outside world but a neural simulacrum of it.

This solved the classic problem of how thought, a different kind of phenomenon from the material world, could represent that world. Or so it seemed to Koffka and his colleagues. But in the 1950s Karl Lashley and other neurophysiologists conducted experiments designed to

interrupt the supposed electrical fields of isomorphic theory. They implanted mica plates in the visual cortex of some animals and in others placed silver foil on the surface of the brain, short-circuiting the different electrical potentials that were supposed to simulate the perceived world. In neither case did the animals respond differently to visual experiences; isomorphism and force field theory was effectively scuttled.³⁸

Yet if force field theory is viewed not as a physiological reality but as an illuminating metaphor, it has genuine value. It says that in a manner analogous to the operation of force fields, we group, categorize, and reorganize our experiences, always seeking the simplest and most meaningful constructs of the contents of our mind. As a guiding image, this comes closer than associationism, conditioning, or any earlier epistemological theory to describing how we perceive, learn, store, and utilize information. Field theory was not the ultimate truth, but it was a better approximation of the truth than earlier theories, and the basis of better approximations yet to come.

Memory is an aspect of epistemology about which Gestalt psychology offered some particularly useful and illuminating ideas.

One was the hypothesis, presented in some detail by Koffka, that the physiological basis of memory is the formation of “traces” in the central nervous system—permanent neural changes induced by experience. It was an acute guess; decades later, neurophysiologists would begin to discover the actual cellular and molecular changes that constitute traces.

Another keen guess dealt with the psychological basis of memory. Previously laid-down memory traces, Koffka said, influence how new experiences are perceived and remembered. Unlike associationism, which said that new experiences are merely added to old ones, Koffka said that new experiences interact with traces, traces with new experience, in ways not available to the mind early in life, and that this interaction is the cause of mental development.³⁹ His idea would be borne out by a wealth of observational data that the Swiss child psychologist Jean Piaget was even then gathering.

Koffka marshaled a mass of experimental evidence to show that memory is not a mere sticking-together or aggregation of experiences, as in association theory, but a weaving together by means of the *meaningful* connections. Among the evidence he adduced was that of Ebbinghaus and his followers, that it is much harder to learn a string of nonsense syllables than a series of words connected by meaning. Koffka gave a simple and persuasive example: If every connection between items were merely one of association, these two lines would be equally easy to learn:

pud sol dap rus mik nom
A thing of beauty is a joy for ever.

Koffka’s comment: “It is not easy for association theory to explain why the second line is learned and retained so much more easily than the first, a difficulty which, as far as I know, was never explicitly mentioned by the associationists.”⁴⁰

Like much else about Gestalt psychology, the truth illustrated by those two lines seems so obvious that one

wonders why it needed to be rediscovered. But psychology has not moved in a steady course from ignorance toward knowledge; its progress has been more like that of an explorer of an unknown land who tentatively advances toward a distant goal by this valley or that, this river or that, and often must pursue a roundabout route or double back on his tracks when the chosen route proves a poor one. The followers of Wundt and the behaviorists made important headway toward the remote goal but went off into dead ends; the Gestaltists put psychology back on a truer course.

Boring made this point with a different metaphor in his magisterial history of psychology: "It appears that orthodoxy had been led astray along the straight and narrow path of sensory analysis. It is the wide gate and the broad way of phenomenology that lead to life."⁴¹ Although the Gestalt psychologists were not the first or the only ones to make this discovery, it was they who made it in a form so convincing that it was amalgamated into the structure of scientific psychology.

Failure and Success

In Germany, as we saw, Gestalt psychology became a leading school in the 1920s but virtually disappeared in the mid-thirties after its three founders and many of their former students left Germany.

In the United States, after the publication of Koffka's introductory article in 1922, Gestalt psychology met at first with great interest and even enthusiasm.⁴² Koffka and Köhler were asked to give seminars and colloquia at nearly all the important American research centers; Köhler was a visiting professor at Clark University in 1925; and Harvard later offered him a visiting professorship, which he had to decline.

But behaviorism was even then rapidly becoming the ruling brand of psychology in America, and there was no room in it for Gestaltist ideas. Most behaviorists saw Gestalt psychology as a regression to a discredited, unscientific nativism. To the extent that nativism means a belief in innate ideas, this was simply untrue. To the extent that nativism means a belief that the mind, by its very

nature, imposes certain kinds of order on experience, it was correct. Gestalt theory was, in a way, a modern version of Kantian epistemology.⁴³

Decades later this central tenet of Gestalt psychology would be strikingly confirmed by several forms of research. Studies of language acquisition, for instance, showed that children sense the grammatical structure of sentences and begin speaking in grammatical sentences long before they are taught anything about grammar. Even more remarkably, a study of deaf children who had not been taught any sign language found that when they were three or four years of age, they communicated by making up strings of gestures—quasi-sentences—that distinguished between agent, action, and object, just as verbal language does.⁴⁴

The antipathy of behaviorists toward Gestalt psychology was reciprocated: Koffka, Köhler, and Wertheimer all were dismissive of behaviorism (and other psychologies) and presented their own approach as the only valid one, thereby offending many American psychologists.

Reviewing the reception of Gestalt psychology in America, the psychologist Michael Sokal writes:

American psychologists were especially bothered by the attitude of the Gestaltists... Recently the term “Mandarin” has been used to characterize the attitudes and behavior of many of the German university professors of the period. In some ways the entire Gestalt movement represented a revolt against traditional German university culture, but in other, deeper ways the Gestaltists shared many traits typical of the faculties of German universities.⁴⁵

The result was that by the early 1930s, Gestalt psychology, though it had become a definite part of the American psychological scene, remained a subordinate part; like the structuralists, functionalists, Freudians, and others, Gestaltists were a minority in a behaviorist-dominated establishment.⁴⁶ Nevertheless, they had an influence on the development of psychology out of all proportion to their numbers and position.

Wertheimer, a warm and impassioned teacher, had a loyal but small following at the New School for Social Research, but no physical research facilities to speak of. Yet according to his distinguished student Abraham S. Luchins, during Wertheimer's decade in America (he died in 1943) he was a "conspicuous and disquieting figure" in the behaviorist milieu.⁴⁷

Koffka, though dry and overly theoretical as a teacher, was adored by the girls he taught at Smith. However, because the college's emphasis was on undergraduate education, he supervised only one Ph.D. in his years there. But he did have an extensive effect on the psychological community through his writings, particularly the encyclopedic *Principles of Gestalt Psychology*, and he would undoubtedly have produced other influential works had his life not been cut short in 1941, at the age of fifty-five, by heart disease.

Köhler, despite his Germanic stiffness, was best able of the three to fit into the traditional academic framework. He created a center of psychological research and scholarship at Swarthmore that attracted a number of top-notch

doctoral candidates, among them David Krech, Richard Crutchfield, Jacob Nachmias, and Ulric Neisser. Köhler retired in 1958 but remained active in research until his death at eighty, nine years later. After his retirement, he received the highest accolade of American psychology, election to the presidency of the American Psychological Association, an acknowledgment both of his personal achievements and of the contributions of the Gestalt movement to psychology.

For paradoxically, even though by midcentury the movement had lost its identity and was fading from view, its most important ideas had become part of the mainstream of psychology. Indeed, they remain a significant part of it today, although a number of Gestaltist ideas are now so taken for granted that they are rarely even identified as such when cited in textbooks of psychology.

The central Gestaltist doctrine, that the whole—the *Gestalt*—is greater than the sum of its parts and that it dominates our perceptions has stood the test of time and testing. In one recent experiment, psychologist David

Navon measured the time it took observers to identify large and small letters in a display like this:

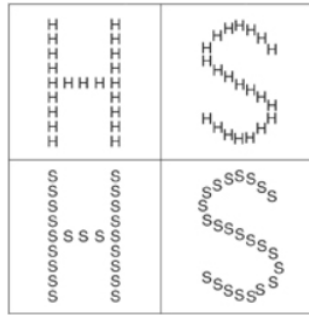


FIGURE 14

The “Forest Before Trees” Effect: It takes longer to identify the tiny letters than the bigger ones they make up.

The Gestaltists 347

Observers were able to name the large letters more swiftly than the small ones, whether or not the small ones were the same as the large ones they made up; in contrast, it took

them longer to name the small letters when they were different from large ones made up of them.⁴⁸ Evidently, the whole was recognized more easily than the parts it was made of.

Prägnanz, the tendency to see the simplest shape in complex patterns (see Figure 10, page 328), has held up as a valid perceptual principle. So has grouping (the Laws of Proximity and of Similarity, illustrated above on pages 326 and 327), although later research has extended and somewhat modified it.⁴⁹

As for problem solving, although the reward-based, trial-and-error model espoused by behaviorism remains valid for many simpler animals, research with more intelligent animals and human beings has followed the direction taken by Köhler, Duncker, and Wertheimer. Newer models, based on information-processing theory, do not contradict Gestalt problem-solving theory so much as provide detailed programs of the step-by-step reasoning and searching for which Gestalt psychology had only such vague terms as “restructuring.”⁵⁰

Gestalt psychology also significantly deepened the study of memory. The work of Ebbinghaus and his followers with nonsense syllables revealed certain of its principles, but only within the narrow confines of the meaningless. Gestalt psychology restored a perspective in which the broader aspects of memory could be investigated—the web of meanings into which we weave new material and through which we locate and recall desired information.⁵¹ Recent work on memory has gone far beyond Gestalt explanations but along the same lines.

Most important, the Gestaltists restored consciousness and meaning to psychology; they did not discredit the findings of Wundt's followers or the behaviorists so much as radically enlarge the scope and dimensions of scientific psychology, re-establishing within it mind and all its processes—including, according to Koffka, meaning, significance, and value. As he said:

Far from being compelled to banish concepts like meaning and value from psychology and science

in general, we must use these concepts for a full understanding of the mind and the world.⁵²

In 1950, when Gestalt psychology was losing visibility as a distinct school, Edwin Boring summed up its fate in terms that have not been improved on:

Schools can fail, but they can also die of success. Sometimes success leads to later failure. [Gestalt psychology] has produced much important new research, but it is no longer profitable to label it as Gestalt psychology. Gestalt psychology has already passed its peak and is now dying of its success by being absorbed into what is Psychology.⁵³

Forty years later, that valuation was reiterated by two perception researchers, Irvin Rock and Stephen Palmer, who were extending and revising Gestalt theories of perception in cognitive science terms:

The list of major perceptual phenomena [the Gestaltists] elucidated is impressive. In addition,

they were victorious over the Behaviorists in their clash regarding the nature of learning, thinking and social psychology. Although behavioral methods are adhered to by modern psychologists, Behaviorist theory has been abandoned in favor of a cognitive approach more in line with Gestalt thinking. The theoretical problems they raised about perceptual organization, insight, learning and human rationality remain among the deepest and most complex in psychology. The remarkable surge of interest in neural-network models attests to the fact that Gestalt theories are very much alive today and that their part in psychological history is assured.⁵⁴

* Wertheimer wrote up few of his experiments, but most of them are briefly noted in Koffka's *Principles of Gestalt Psychology* (1935).

-
- * Gestalt psychology is often confused with Gestalt therapy. The former is a theory of psychology; the latter, a technique of psychotherapy that uses a few key concepts borrowed from the psychology, but greatly altered in meaning, plus notions drawn from depth psychologies and existentialism.
 - * Plural form of Gestalt; used more often in psychological writing than the Anglicized "gestalts."