

Gestalt Perspectives on Cognitive Science and on Experimental Psychology

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At the 1st author's request, the 2nd author was interviewed on Gestalt psychology's origins and utility for modern experimental psychology. Wertheimer's connections with Gestalt psychologists Max Wertheimer and Wolfgang Köhler and his study of Gestalt problems and methods, give him a special perspective on these issues. Several points for modern psychology emerge from the Gestalt perspective. Phenomena should be studied within their full context; there is a need to acknowledge the domain specificity of principles in experimental psychology; it is wise to study phenomena that either exist in the real world or have close real-world analogues; psychology must recognize interchanges between organisms and surroundings as determinants of behavior; and a data-driven perspective must complement, and sometimes replace, theory-driven searches for broadly applicable, nondomain-specific principles.

Psychology is prone to intellectual fads. The field can be criticized for embracing novel ideas and discarding prior ones without necessarily resolving the issues that gave rise to the earlier thinking. This charge, of course, is not unique to psychology; it applies to many of the sciences. The almost wholesale replacement of relativity theory by quantum mechanics in physics in the 20th century is one such example. The linear *scala naturae* reasoning of Spencer that largely supplanted the richer Darwinian evolutionary thinking is another. Yet, in recent years it has occasionally been recognized that the potential relevance of a body of theory or data does not disappear with its loss of popularity. Modern physics is reuniting relativity and the standard model under the banner of superstring theory, and the theory of punctuated equilibrium in evolutionary biology has made sense of a number of the more obscure factors in the Spence-rian model.

A retrospective view of experimental psychology might yield similar insights. The rich

tradition of research in the Gestalt mode is ignored in much modern work. Overshadowed by the long popularity of behaviorism and scattered by the chaos preceding the Second World War, Gestalt theory has had only a modest influence on modern thinking in such areas as cognitive psychology, beyond a few historical acknowledgments. Yet, in a wide variety of fields, it could be claimed that the Gestaltists "got there first." The focus on mental activity, the idea of isomorphic relationships between brain events and experience, and the inclusion of organismic and contextual factors in the study of psychological variables all were part of the Gestalt tradition. As psychology adopts ever more literal machine (computer) metaphors of mind and brain (metaphors typically of such complexity that a larger view is seldom taken or sought), it might be productive to examine again the Gestalt tradition, a tradition of experimental psychology focused on context and organism rather than on disembodied modular components of hypothetical mental and physical structures.

To this end, the first author (Matthew J. Sharps) requested a series of interviews with the second author (Michael Wertheimer), who had close personal and intellectual ties with two founders of Gestalt theory, Max Wertheimer and Wolfgang Köhler. A son of Max Wertheimer, Michael Wertheimer studied as an undergraduate with Köhler and, after a PhD in experimental psychology from Harvard, recently re-

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tired from a long career as a professor of psychology. The main subject of the interviews was the intellectual origins of Gestalt psychology, along with the actual and potential utility of Gestalt theory for modern psychology. The verbatim text was edited to diminish redundancy and irrelevancies and to try to enhance the clarity of the ideas expressed.

Antecedents and Intellectual Descendants of Gestalt Psychology

Theories do not arise in vacuums. There are always ideas, information, and intellectual ferment that contribute to the specific concepts developed by any given theorist or group of theorists; even the cohort in which given theorists find themselves may radically change the focus of their thinking and research (Bruce & Bahrick, 1992). Gestalt theory is no exception. Gestalt psychology arose at the same time as the behavioristic movement. The Gestalt school presented a variety of significant challenges to the behavioral paradigm, which, as is well known, denied any role for mind in psychology. Recently, there has been little attention to the ideas and sources of the Gestalt movement, and the legacy of Gestalt theory for modern psychology, the corpus of ideas that could have survived the behaviorist years, has also been relatively neglected. An understanding of the potential utility of Gestalt thought must address the ancestry and initial impact of Gestalt psychology in the context of the broader canvas of the history of psychology.

- S: One can see the philosophical antecedents of introspection in Wilhelm Wundt's work and Edward Bradford Titchener's structuralism, and the basic concept of the experiment in Ionian empiricism. What were the antecedents of Gestalt ideas? How were these related to the work of earlier scholars?
- W: As for Wundt's introspection and Titchener's structuralism, there are at least two aspects of their thought that in some ways were taken over by the Gestaltists. One was that the subjective, in the Gestaltists' methodology of the wholistic perspective of phenomenology, could be investigated: The question of what human experience is really like is a legitimate subject for scientific exploration. That's implicit in both Wundt's work and the work of the Gestalt theorists. There's also the "creative synthesis" idea of Wundt. Wundt was aware that the whole is different from the sum of its parts; that's what his principle of "creative synthesis" tried to explain. While his ideas were largely elementaristic, and while one task of psychological experimentation for Wundt—but only one task among several—was to discover the elements that make up a particular subjective structure, he was aware that the whole subjective structure is not just the sum of these elements, but that some active mental principle or process is needed, a kind of creative synthesis, to consolidate these elements in a way that makes them into the structure of which they are the components.
- S: Generally, in textbooks, Wundt's and Titchener's thinking is represented as being predominantly concerned simply with the interrelationship of elements.
- W: That is the way it's often described. But Wundt's experiments tend to belie that. He did many experiments, for example, on reaction time which did not utilize introspection at all. In some experiments reaction time was measured in much the same way in which modern cognitive psychologists use reaction time to computer-presented stimuli as the main dependent variable.
- S: So the idea of elements coming together to form a novel order, the notion of emergent process, what might be referred to as "executive function" within the ordering of structural elements, was actually present in Wundt's thinking?
- W: Very much so. But then von Ehrenfels in 1890 added the new element of form. He said a whole, like a square, is not just the sum of four equal straight lines plus four right angles, but there's also another added element, the form quality of "squareness." That was one way of trying to deal with the issue that Wundt was addressing with his principle of creative synthesis. How do the "elements" get synthesized into the unique object that is a square, which is different from just a bunch of four equally long straight lines

and four right angles? It's those things in a particular arrangement, with the added element of "squareness," that result in the emergent property of "squareness" in the whole. A square, and in Friedrich Schumann's 1900 experiment a diamond, both have the same basic elements in one sense, but in Ehrenfels's analysis two different form qualities are added, "squareness" in the first case and "diamondness" in the second, which differ in orientation and form quality.

S: Just for historic clarification, it is known that the Gestaltists spawned numerous offshoots, but what is the relationship between Gestalt psychology and the later Gestalt psychotherapy of Fritz Perls—and the psychology of Kurt Lewin?

W: Both Mary Henle in 1978 and Rudolf Arnheim in 1974 have published comments on Perls which show that there's absolutely no relationship between his approach and classical Gestalt theory. I happened to have a chance to talk with Fritz Perls after he gave a lecture at the University of Colorado several decades ago. When somebody introduced me to him as Max Wertheimer's son he became awed and shook my hand, showing his reverence for "the great Max Wertheimer." He told me that he had heard a lecture about figure and ground by Max Wertheimer when Perls was a young medical student in Frankfurt. He was profoundly taken by my father's lecture style. He proudly claimed that thereafter he had never heard another Gestalt lecture or read any Gestalt work of any kind by anybody.

Perls's 1969 version of psychotherapy was essentially an outgrowth of Freudian psychoanalysis. When he decided to give it a name, he wanted to call it "Gestalt therapy" in honor of my father, to show his admiration for him. His wife, Laura, tried to dissuade him from that by saying there really wasn't much in common between Fritz's therapy and Gestalt theory, but he was adamant. And then he went on to use the concepts of figure and ground in ways that are totally unrelated to the way in which the Gestalters used it, as Mary Henle (1978) points out. Perls's use of figure and ground as something subjec-

tively determined is almost identical with what Wundt called the "focus" and the "field" of attention or consciousness, which are unrelated to the Gestalt ideas of figure and ground, for which one's voluntary preferences are irrelevant.

As for Kurt Lewin, his research and theory (e.g., Lewin, 1951) were viewed as a somewhat imprecise, vague but closely related outgrowth of Gestalt theory by both Köhler and Wertheimer. Apparently he was never fully accepted into the fold by any of the three original Berlin Gestaltists—Wertheimer, Köhler, and Koffka—although many historians do view him as a classical Gestalt theorist.

S: As was true of other schools of psychology, Gestalt thought obviously inspired a number of offshoots, but it appears that none of them are fully faithful to the original. Is that true?

W: There are some exceptions to that statement. One is Rudolf Arnheim's extensive work on the psychology of art. That work was, I think, accepted by Köhler and Wertheimer as a real Gestalt contribution. His 1954 book, *Art and Visual Perception* (Arnheim, 1954/1974), does a beautiful job of using the basic Gestalt principles of perception and organization to make sense of great art. Just as Wertheimer was able to show in detail how melody and music in general consist of Gestalten, Arnheim did the same for architecture, sculpture, and painting, with compelling Gestalt analyses of great works of art.

S: So the same sort of logical necessity that exists in a piece of music would be there, for example, in a statue by Michelangelo or Rodin?

W: Yes. Particular parts of a work of art create requirements for what has to be in other places in it. When those requirements are met, they in turn generate requirements for yet others. There's a genuine interrelation among the parts and their qualities.

S: It strikes me that this sort of logical necessity might be a way of judging art.

W: Yes. In good art, the various subparts generate requirements for other parts, which all are fulfilled appropriately. What makes a good photograph, too, is the way it's

composed and framed, so that there is balance within the picture, a balance of color, brightness, shape, or texture, or of a combination of such features. The basic principles are the same.

Aesthetics is an area in which all of the Gestalt psychologists worked, some touching on it in their writings, and all of them in their lectures. Once you become sufficiently familiar with a particular artistic domain or genre you begin to understand the requirements and can judge what's good within it. A good piece of art is one that is true to the principles of its particular medium and genre, and to the particular rules that are used to create that kind of art. But it can be quite different from one medium to another. Consider Chinese classical music, North Indian classical music, Western classical music, Western rock and roll, 19th-century French painting, impressionism, and so on. They all have their own—somewhat different—rules and regularities. One of Picasso's peculiar geniuses, for instance, was breaking traditional rules in ways that created new rules, which he fulfilled beautifully.

The Phi Phenomenon: A Gestalt Demonstration

The phi phenomenon is a simple demonstration of a form of apparent motion. At certain time intervals, for example, the alternate blinking of a pair of light bulbs gives rise to the illusion that the observer is looking at one light leaping back and forth between the two bulbs rather than at the two blinking lights that are actually present. The significance of the phenomenon was emphasized in 1912 by Max Wertheimer (Wertheimer, 1912a). The phi phenomenon constitutes a direct challenge to the idea that sensations and perceptions correspond point for point with the local sensory stimuli. The phenomenon proved that the normal human nervous system is capable of generating percepts that do not correspond directly with the mosaic of physical stimulation. It perceives a leaping light instead of two blinking lights. This demonstrates that perceived reality can be reconfigured by mental activity. The phi phenomenon possesses a potential relevance for the

development of modern cognitive concepts that transcends its apparent simplicity.

S: The discussion of Gestalt principles and art, with all its complexity, reminds me of a much simpler Gestalt issue, the phi phenomenon. This form of apparent motion constituted a topic of pretty critical importance in the school's history. How did the Gestalt use of the phi phenomenon begin?

W: That's pretty straightforward. In the first decade of this century, Max Wertheimer worked with a physiologist in Vienna by the name of Sigmund Exner, who was doing research with short straight lines that were briefly successively exposed in slightly different positions. Apparent motion, in the sense of perceiving motion in successively exposed stationary visual stimuli, was known long before it was discussed in his paper. What was new, what was productive about Wertheimer's work on the phi phenomenon, was his recognition of what the phenomenon implied.

S: And the implication?

W: That the perceived motion, which is phenomenologically compelling, doesn't correspond at all with the piecemeal features of the stimuli; it is an emergent property. It convincingly disproved an almost universally accepted assumption at the time, the constancy hypothesis, which held that local aspects of a subjective experience always agree with the corresponding local features of the physical stimulus, that is, that the piecemeal relationship between stimulus and experience remains constant.

S: So the whole in subjective experience is different from the sum of its parts. The subjective experience of movement is an experience that does not correspond point for point with the mosaic details of the physical stimulus.

W: That's right. Perception is not just a passive recording of what's "out there" in the stimulus, but is an inherently active, constructive process.

Productive Thinking, *Radix*, and Insight

The phi phenomenon demonstrates in a way that mind may reconfigure physical reality. This

basic concept was massively expanded in Max Wertheimer's conception of productive thinking, in which a somewhat similar process of reconfiguration of tremendously more complex data sets may be seen to result in intellectual creativity, on a scale ranging from simple tasks such as description of a visual object to gigantic tasks such as the creation of the theory of relativity. The concept of reorganization enables the theorist to understand and to unify, under a single conceptual aegis, much information on creative cognition. Reorganization is crucial in insight and in comprehending the *radix* of an issue, understanding the critical core of a problem space in creative problem solving. The concept also sheds light on purely reproductive thinking and on the antithesis of creative thought, nonproductive thinking, as exemplified in rote learning.

S: One of Max Wertheimer's most seminal contributions was his conception of the nature of productive thinking (1945). What was he doing intellectually in coming up with that concept?

W: Some of his earliest work was in the "Völkerpsychologie" (sociocultural psychology) tradition of Wundt, although Wundt didn't start it. There were other people such as Lazarus and Steinthal in, for example, the psychology of language who were doing such ethnopsychological work as far back as the early 1860s. The fascination with other cultures and how they do things was part of the intellectual ambience in Germany in the early and middle 19th century, and persisted until late in the century.

One of the first papers that Max Wertheimer published (1912b) was on the thinking of "natural" or indigenous people. He was fascinated with alternative ways, across cultures, of dealing with numerical concepts. He was particularly intrigued by how beautifully some approximate numerical concepts fit the task for which they are used. In the introductory part of that paper, he commented that it's inappropriate to ask how "primitive" concepts of pretechnological peoples differ from "advanced" Western concepts, and argued that asking the question of how you get the transition to the Western ideas

from the pretechnological is much too "culturecentric." What one has to do, to do justice across cultures, is see what tasks people are trying to cope with, and understand how the local conceptual apparatus helps them to deal in a practical way with real everyday problems.

There are passages on the dust cover of the first edition of *Productive Thinking* in 1945 about his raising the question "How does real, productive thinking actually occur?" (thinking in which there is a real problem for a real person in a real situation). By the use of thought processes, productive thought processes, sometimes you get aesthetically pleasing, as well as practically highly successful, solutions to real problems.

His argument was that the then-classic psychology was off on all kinds of irrelevant hair-splitting types of investigations and ought to go back to the major genuine issues, such as: How does real thinking really occur? How do people really deal with problems? And, again, from an aesthetic perspective, how is it that people come up with beautiful solutions to complex, difficult problems?

There's a hint of Gestalt thought even in a musicology paper back in 1910, which analyzes the music of the Vedda, an indigenous culture in Ceylon, now Sri Lanka, where the songs typically had only two different tones that varied relatively little, but somewhat, in intensity and length (Wertheimer, 1910). Wertheimer's argument was that these songs display an attempt to complete a structure that is established early in a melody; the early part establishes what the requirements are for the rest of the melody. A number of examples which he studied from the phonogram archives in Berlin of music collected from all over the world showed that this "primitive" music was not imprecise, in the way it had been described, but followed its own rules.

S: Would Max Wertheimer have held that there is the same kind of logical necessity in a piece of music that there is in the solution to some specific problem?

W: Definitely. For instance, in his lectures he sometimes used an anecdote about a per-

son who was the neighbor of a musician in an apartment house hearing the musician begin to play a melody on the piano. The melody stopped in a place that made no sense at all, and the neighbor became concerned, knocked on the musician's door, and found that the musician had passed out (Wertheimer, 1989a). There's a logic in melody, in a piece of music, which makes certain things necessary in what comes next. I'm not sure whether it was he who first mentioned this to me, but I remember hearing somebody admire Beethoven for having an uncanny sense of knowing what had to come next. A good piece of music—good in the sense of fulfilling the requirements of the particular genre—sets very strict requirements—and note that “requirements” in this context is a technical term in Gestalt theory—for what has to come next.

S: This is basically logical necessity?

W: Not only logical. It is crucial in almost all Gestalt thought, certainly in problem solving. As for logical necessity, he had a term for the core of a problem: the Latin word for root, *radix*. To solve a problem you have to comprehend its *radix*. You have to understand its core and peel away the superficial irrelevancies. In productive thinking: If you're building a toy bridge out of wooden blocks, for example, the color of the blocks is irrelevant to whether the bridge will stand or not, and hence in constructing the bridge you should ignore the color. Their size, however, is crucial. The two uprights have to be roughly the same height. The distance between the two uprights and the length of the cross piece is crucial. There are a few things like that that are part of the *radix* of the situation and others that are irrelevant or superficial. Good problem solving recognizes that difference and tears away the irrelevant attributes; it gets at just the core.

S: In productive thinking, insight is critical, especially insight into the core of a problem, the *radix*. The original notion of insight is usually attributed to Köhler's 1925 work with chimps during his time on Tenerife. Is that the first, the initial, discovery of insight in reasoning or problem solving?

W: It was the first convincing demonstration of the occurrence of insight during problem solving by apes. Stumpf, in Berlin, had already done some work on problem solving, and both Köhler and Wertheimer had been students of Stumpf's. So probably he played some role in all of these developments. It was Stumpf who got Köhler sent to Tenerife. But the idea of insight has been around for millennia: Think of Archimedes and his “Eureka!” when he realized that an object's specific gravity can be determined by measuring the amount of water it displaces when it is immersed.

S: What are the criteria for insight in the analysis of problem solving?

W: The Gestaltists identified at least two of them. The most crucial is that the solution be appropriate to the actual characteristics of the problem. Another is that the major test of insight is transferability: transfer to structurally identical but superficially very different problems.

For that matter, published in 1989 was a nice report (edited by Siegfried Jaeger) by Köhler on problem solving by an orangutan. The ape station had been established on Tenerife even though apes were not indigenous to that spot. Köhler also had a couple of oranges brought there for his research, and there are beautiful descriptions of problem-solving behavior in a single orangutan. Köhler's second one died almost as soon as it got there, and Köhler was reluctant to publish on the basis of results from just one animal. But there are descriptions of this animal's dealing with the same basic kinds of problems that were presented to the chimps: having to figure out how to acquire food just outside of reach. There was one instance of tool making, tool invention, to reach a bit of food outside an enclosure, in which the orang went up to the top of the enclosure across which there happened to be a ragged wooden beam. She bit off a substantial and fairly lengthy splinter and let it fall, but when she went down to pick it up, she realized it wasn't long enough. So she went back up and bit off a longer splinter, and used that to pull in the food.

What's argued by Köhler and, of course, by Wertheimer too, and Koffka (1935), is

that for insight to be demonstrated, the behavior must be highly specific to the requirements of the situation; it must be appropriate, and it must work.

For that matter, the distinction between “good” and “bad” errors, which is prominent in Gestalt writings on productive thinking, was also there in Köhler’s experimental work on intelligence in anthropoid apes (1925). A good error is one that somehow is appropriate to the structure of the problem situation, while a bad one is blind to it. Incidentally, there is a feature that seems ludicrous in some recent computer simulations of behavior such as tool use by apes, in which the idea is to use local materials, such as boxes, to get bananas which are suspended from the ceiling. This manipulation is to make central to the simulation the notion of pushing a box somewhere—without specifying that it has to be pushed underneath the banana—and getting up on it. The argument is that pushing a box is a critical part of the solution. This simply isn’t right: It’s getting the box to be in the right place that’s crucial, in terms of the *radix* of the problem. The fact that the chimp does it by pushing rather than by pulling or by getting the experimenter to push it for the chimp, or by some other method, is immaterial.

There’s a wonderful example of a chimp getting at the *radix* of a problem in Köhler’s (1925) *Mentality of Apes*. At one point in one experiment Köhler was in a cage with a chimp, and a banana was suspended out of reach from the ceiling but no boxes and no sticks were available. The chimp took Köhler by the hand and guided him directly underneath the banana, and before he knew what was going on Köhler had been used as a ladder for the chimp to reach the banana. The tool is irrelevant as long as it’s firm enough, stable enough, movable, and has a few other crucial characteristics, whether it be a box, or a stick—or a person. Sometimes a stick was used not as a rake but as a pole to climb on. Just place it vertically, climb up it before it falls over—and it falls, of course, but not before the chimp reaches the banana.

S: Did Köhler or Wertheimer provide any rules for getting to the *radix* of a problem, getting to the crux of it?

W: There’s an implicit general principle in examples used in Wertheimer’s lectures. This general principle is that every Gestalt has its own internal laws, and that one has to discover these laws in order to understand the Gestalt. If it’s a problem situation, you have to understand what, in that specific situation, is crucial and what is peripheral.

S: So, does that mean that creating a general framework for problem solving is effectively impossible? You’re confined to domain-specific frameworks?

W: Probably so. And that’s one reason why there is something so crucial missing from any general computer problem-solving program—unless it is specific to a domain, in which case it might work. From a Gestalt perspective there are no *general* training programs for how to think better. How to think better involves making the effort to understand, in a given situation, what is crucial and what isn’t, and how the crucial parts are, in fact, related to each other—or aren’t related. Productive thinking requires one to understand the individual laws, and the dependent part qualities, to use a technical Gestalt term, that are inherent to that specific problem. There can, therefore, be no general problem-solving strategies or programs. There are no *prima facie* recommendations for how to approach a problem in the abstract, other than with an unprejudiced open mind, in terms of general principles for enhancing the development of insight.

S: That’s discouraging, but on the other hand it’s a pretty valuable principle: You know you have to go for problem-specific or domain-specific solutions. But at any rate, in broad, general terms, what is insight? And how would you get at it?

W: I guess the tradition goes all the way back to Archimedes. The recognition that there is such a thing as catching on has been around for thousands of years. Insight is the state of going from a state of confusion and not understanding, and things not making sense, to making sense, to “clicking.” So a subjective, phenomenological process is part of it. That’s not enough, though, because you might feel as though you have an insight even if it actually isn’t correct.

One way to check whether it's correct or accurate or not is the test of transfer—and that's crucial. Come up with other structurally similar problems which are superficially very different, and see whether the solver can apply the same solutions there in an appropriate way. So, how do you know when somebody has had insight? One criterion, although it's far from perfectly reliable, is to ask them. Then determine whether there is transfer to other problems which, again, superficially may look terribly different, but which in fact have similar structure. That's an even better criterion.

- S: To what degree is the insight experience cognitively penetrable?
- W: I'm not sure I know what you mean with that question. But one of the perennial issues about insight has been whether it's instantaneous or not. Köhler is often characterized as having said "Yes, the insight comes in a flash." And yet both Köhler (1925) and Wertheimer (1945), in their writings about insight, discuss its evolution, its becoming. There is a flash, the "aha" moment, when the thinker realizes "Yeah, I think now I've got it." But the development of the insight is by no means instantaneous. It's something like pattern recognition, and something like the tip-of-the-tongue phenomenon; there is a period of search until it's resolved: "Oh, yeah, that's the word I was trying to find," when you've found it. But that critical event may not be "penetrable," that moment when the structure has clicked and made sense, when the conception of the problem situation really matches the "objective" problem situation in such a way that the problem and its solution are completely clear.
- S: Isomorphism in a sense?
- W: Yes, yes: What a neat thought! Isomorphism between the subjective representation of the problem situation and its objective Gestalt characteristics, its structural dynamic features.
- S: Can this be mapped? Can that relationship be mapped in any way? How do you get at it empirically?
- W: I guess one way is Karl Duncker's (and Köhler's and Wertheimer's) 1945 methodology of posing problems for problem solvers. You either have them "think aloud," that is, give you a continuing verbal protocol, or you just watch their behavior if they're nonverbal creatures. Nice examples of nonverbal problem-space conceptions were described by Köhler, who realized what the problem space must look like for chimps who do various things that happen not to work or that do work, and which may or may not coincide with Köhler's conception of the space.
- A similar procedure was used in 1926 by Graham Wallas in coming up with the four stages of creative thought (preparation, incubation, illumination, and verification): asking people who had come up with some productive thinking the question "How did it happen, reconstructively?" What emerged was that the problem solver first got immersed in the problem and wrestled with it consciously; that's preparation. When the problem still persisted, the thinker must have continued wrestling subconsciously with the problem while doing some other things. This is incubation, which continues until illumination (or insight) occurs. After illumination comes verification, to make sure that the solution really works. It should be noted, though, that this was not a Gestalt analysis and had little if anything to do with Gestalt theory.
- S: In regard to the distinction between productive thinking (such as coming up with an insightful novel solution to a problem) and reproductive thinking (such as recalling a memorized answer to a question), it would appear that reproductive thinking is nothing more than memory search.
- W: Probably so.
- S: So anything that is actually reasoning would be productive thinking?
- W: I would think so. Which reminds me of the old "Høffding function" that Köhler, in particular, emphasized. The argument (in his 1929 book, for instance) is that even for reproductive thinking, recall of some item is predicated on similarity. Just to be able to recognize that a face you see is one you've seen before, the present percept of the face has to "make contact with" the memory trace of the previous time you saw that face. The

similarity between the present percept and the memory of the earlier one is crucial. Comparably, what's needed in a computer program is a similarity detector or identity detector, or something like that. You've first got to specify what the characteristics are that are crucial to solving the problem, say, of finding the papers by Matt Sharps on this particular disk. This is fairly easy to do if you have a particular pattern of button presses for the letters in the name that can then be matched with the pattern in the "memory" that is on the disk.

But the definition of similarity isn't necessarily appropriately always that kind of a computer analogy. Consider the tip-of-the-tongue phenomenon. You have specifications which are there, even though you can't retrieve the particular item when the tip-of-the-tongue phenomenon is going on. The specifications are clear enough that you can reject various alternatives that you know won't fit. But even so, you don't yet have the one which *does* fit.

There was a flurry of publications some years ago on the definition of similarity, but the issue was never really resolved. For the Gestalt psychologists, similarity is typically a Gestalt phenomenon: some emergent property that is not present in the parts in isolation.

S: In determining similarity between two instances, you're dealing with a qualitative transformation in some sense.

W: Maybe so. I think you put your finger on an important distinction here. Computer analogies are almost all quantitative, and the Gestalt theorists almost always point to crucial qualitative characteristics. This is a little different from the issue of reproductive versus productive thinking. My guess is that between the qualitative and quantitative realm there is some continuity, more so than between productive and reproductive thinking. A sufficiently large quantitative change may become a qualitative one. But you can't go in the other direction. A qualitative change can't usually easily be accounted for in purely quantitative ways.

S: And the point at which a series of quantitative changes would suffice to define a qualitative change. . . .

W: Would depend on the situation, on the domain.

S: How would you empirically address what qualitatively forms the Gestalt in a specific problem?

W: By varying certain crucial dimensions. The question then becomes how large a (quantitative?) change is needed in order for it to generate a qualitative change, and that can vary even along the same dimension in a "Gestalt" way, of course, as a function of what's happening in other crucial dimensions at the same time. These things all tend to be interrelated to some degree.

S: My suspicion is that there would be more to it than simple quantitative changes. But I don't know what else could be in there, what could be in the soup, if you will, that changes it.

W: What else is in the soup is the quantitative (or qualitative) variation of other critical dimensions. How much you can change dimension *A* in order to get an exemplar no longer to be a good exemplar of this class would depend on how much other dimensions that are also critical—*B*, *C*, and *D*—have changed.

S: So, for the Gestaltists, is the qualitative shift nothing more than multiple quantitative shifts, possibly along many dimensions?

W: That would depend upon the specific issue being investigated. Usually no additive model will work, and even no simple multiplicative one of variation in dimension *A* and *B* and *C* and *D*. That all becomes an empirical question, the answer to which will be different in different specific cases. And I don't know, for instance, how any additive or multiplicative model can handle an event such as a soap bubble bursting when it's pricked by a pin. The relatively new chaos theory in mathematics seems to be both quantitative and qualitative. Perhaps this kind of theory could be helpful in clarifying the relationship between quantitative and qualitative changes.

Domain-Specific Reasoning

As has been argued, an important tenet of Gestalt theory is the domain specificity of any particular problem space. In order to think productively and creatively, one must recognize the critical facets of a given problem, facets that may be utterly idiosyncratic to the task at hand. The idea that one may have to derive different sets of principles to deal with different kinds of problems may be unaesthetic from the standpoint of many working in theory-driven, mainstream experimental psychology, with its ubiquitous predilection for seeking out grand unifying principles. And yet even in physics, the discipline for which a grand unifying theory of physical forces has long been a goal, such overreaching, unassailable principles are more an ideal than a reality. The quick succession of relativity theory, quantum mechanics, and the realization from nonlinear dynamics ("chaos theory") that the universe is less deterministic than probabilistic has given rise to a new and somewhat less ambitious perspective in many scientific circles: that even in the comparatively simple world of physical particles and their interactions, grand laws that govern everything may be more a creation of the human desire for order than they are fundamental reflections of nature. In the life sciences, including psychology, within which the complexity of interacting systems may defy even the boundaries of chaos theory, it may be naive to try to formulate grand unifying theories to which exceptions do not occur. Living systems and their behavior may well be too complicated to describe universally in the manner traditionally desired. The Gestalt insistence on domain-specific principles deserves attention.

- S: Are there any Gestalt principles for establishing boundaries for a given domain, or for any particular whole or Gestalt?
- W: That's a significant question which has often been raised by critics as well as by people who are just curious about it. Boundaries of Gestalten are typically clearly self-evident, and often they are highly domain specific. Gestalten typically have their own internal rules and their own specific segregation from other Gestalten or the "background." To do justice to a phenomenon, you've got to un-

derstand that phenomenon in and of itself, not impose your arbitrary structure on it—whether that phenomenon be a work of art, a piece of thinking, or anything else. Don't analyze phenomena with predetermined ideas of categories, parts, or analytical units, but let the phenomenon be itself and try to understand its inherent structure. Let it lead you.

- S: There is no bird's eye view, then; you're inside the phenomenon, you're inside the domain where you are not in a position to make universal judgments.
- W: Not really. Gestalten are real phenomena in the natural world, not the whimsical, arbitrary creations of a mind.
- S: Gestalt psychology would seem to lead necessarily to an ethological perspective. In other words, if behavior is relatively domain specific, the old behaviorist notion of "We are going to establish universal laws of learning" would seem to work far less well than the ethological perspective of "Well, here's this particular species and it behaves in a certain way in its own environment." Are the Gestalt viewpoints more sympathetic to an ethological model of mentality and behavior?
- W: I wouldn't necessarily draw a contrast between ethological perspectives and behaviorism, but your term "domain specific," for me, is close to the ethological approach. That is, you've got to understand the phenomenon and organism in its own natural context. But I don't see that as contrasting with behaviorism necessarily.

Probably the best way to find out about learning in humans is to study learning in humans. If you're interested in what makes pigeons tick, or rats, study them in situations that are appropriate to their natural habitat. The laboratory study of conditioned reflexes, for example, is potentially far removed from that. It is not likely to be very useful, which goes back to Egon Brunswik's (1956) point about ecological validity. This is something that I don't think has ever, in detail, been fully analyzed, but my guess is that there's a real affinity between the Gestalt approach and Brunswik's prescription, at least in terms of studying phenomena in a way that is not too artificial. Don't remove

them too much from their natural context—which makes good Gestalt sense, because often things that occur in the real world occur in a context not all of which you understand at the time. And it's only by studying the phenomenon in its real, natural setting that you can discover what aspects of the context are relevant to that behavior of that animal.

S: How would the Gestaltists view the concept of reinforcement? Is it a question of the creation of stronger connections between stimuli and responses?

W: I think the Gestalt theorists would have maintained that Tolman's 1932 interpretation is better: A positive reinforcer shows that something worked. It's informative. A reinforcer becomes part of what Tolman called sign-Gestalt-expectations: If I do this in this situation, then that will happen. In effect, a reinforcer is feedback from the environment showing that I've gotten closer, or that I've succeeded in getting at what the Gestalt theorists would call the critical aspects or *radix* of the structure of the problem situation. If a reinforcement doesn't occur, that's informative because it means I'm not viewing it right. I haven't paid attention to what is critical in the situation, haven't responded to it appropriately. So it's information, rather than a strengthener of a connection.

As far as reinforcement occurring in the sense of the fun of solving a problem is concerned, that's another matter. One of the major sources of pleasure for organisms, including humans, is to succeed in coping with a challenging problem or situation. It's fun. Solving a problem is fun. It also goes back to some of the curiosity work that people like Daniel Berlyne (1966) conducted: monkeys learning to open up locks just for the sake of opening the locks. I don't think the Gestalt theorists would have put it quite this way, but apparently coping successfully with a challenging situation is something that's pleasant, that's inherently positively reinforcing. That is, though, in some ways a different conception of reinforcement than the strengthening of a stimulus-response

connection (e.g., Hull, 1952), or the enhancement of the probability of response à la Skinner (1938).

S: Is there any use, in the Gestalt formulation, for exterior, external reinforcement? Does it have any place in Gestalt theory?

W: In some ways yes, in the sense of its being a kind of validator.

S: No, I meant in the sense of strengthening a connection, as you were saying.

W: I don't think so. In fact, some recent work in the psychology of motivation on extrinsic rewards driving out intrinsic motivation makes good Gestalt sense. Extrinsic reinforcers can interfere with the inherent motive to do justice to a situation, to meet the requirements of a situation. Straightening a picture that's hanging crooked may be an example. That is a classic case of a Gestalt requirement "out there" which is inherently motivating. If a picture is hanging at a slant, almost everybody, even if there's nobody else in the room, will feel an impulse to go over and straighten it. You can say "Thank you," or smile if you're the owner of the place with the picture, but that's almost irrelevant. The "thank you" or smile is an external reinforcement which has nothing to do with, or may even interfere with, the built-in human tendency to do justice to the requirements of that situation—that the picture hang straight.

S: So when a problem is solved, basically it seems to have to do with doing something that fulfills the requirements of the problem. To go back to isomorphism for a moment, does this, for the Gestalters, have anything to do with creating an isomorphic relationship between the problem space and processes in the nervous system?

W: Isomorphism, as applied to what is going on in the nervous system, means in Gestalt theory that there is a structural dynamic correspondence between crucial aspects of the experience and the structural dynamics of the underlying brain event. A classic 1944 example of Köhler and Wallach's is that prolonged inspection of a visual figure produces an increased resistance, in a very literal, physical way, in the corresponding brain tissue, a kind of "satiation"

that results in the tissue becoming resistant to further activity. The resulting illusion or "figural aftereffect" is an apparent repulsion of visual test objects away from the area that has been satiated. There is an event in the neurologic realm, satiation, which results in the apparent increase in visual distance perceptually across the corresponding visual space.

Gestalt Psychology, the Nervous System, and the Nature of Memory

The relationship of psychological events to physiological processes in the nervous system is of obvious importance. Gestalt psychology gave rise to several experiments and theoretical perspectives on brain-behavior relationships that do not seem to be well known any longer, but the results of which may have significant heuristic value for modern research. In addition to perception, one area of interest is the Gestalt perspective on memory and the neural basis of memory. At the end of the 20th century, the engram, the physical basis of memory, still remained elusive. Perhaps Gestalt ideas on the dynamism of memory may shed some light on why psychology has failed to isolate the engram at this time in the history of the field.

S: Did Köhler go into the relationship of brain to experience?

W: Yes, indeed; that was the intent of the Gestalt idea of isomorphism. It started with Max Wertheimer's 1912 phi paper (Wertheimer, 1912a), in his suggestion that there is a kind of "short circuit" in the brain that corresponds to the perceived apparent motion. His explanation of perceived apparent movement was that there is a structurally, dynamically-the-same relationship in the corresponding brain tissue. What must happen in the brain, he said, when you see the apparent motion of one object moving back and forth when two separate stimuli are presented successively is that there is a kind of short circuit between the two stimulated places, the two places in the brain stimulated successively a short time apart by the two stationary lines. I think both he and Köhler meant that quite literally.

How literally Köhler meant it is clear in

an experiment that Köhler did on me which, for various reasons, didn't work. He put a couple of electrodes on my occiput and had me look at a pattern of test figures. There were equal pairs of small squares to the right and left of a fixation point, equally far apart vertically. Then he induced a very weak electrical current in that part of the occiput which would have corresponded with the space between the two right-hand squares, trying to see whether he could, in that way, induce the same figural aftereffect (that the two right-hand squares look farther apart than the left-hand ones) you would get if you use an inspection figure to satiate the space between those two squares. The problem was that, for various technical reasons, apparently the type of electric current he passed through my occiput, a very mild one, was dozens of times stronger than he had intended. The result was that I got a mild headache, but there was no clear distortion of the visual field. The reason for mentioning that experiment is that he did mean it very literally, that is, that there is a perfect correspondence between the dynamic properties of the relevant brain tissue and the dynamics of the corresponding part of the visual field. You could enhance the resistance either by long visual inspection of satiation figures or by a direct electrical intervention.

S: Ultimately, that whole idea seems to have been somewhat vindicated in work on the occipital striate cortex.

W: Yes and no. There was a group of experiments, the most critical by Lashley, Chow, and Semmes in 1951, in which gold foil was inserted on the cortex of cat and monkey, and cuts were made in the visual cortex and some kind of resistant material was inserted in the cuts. But there was no apparent distortion of visual performance thereafter. According to Lashley et al., the manipulations should have fundamentally altered the conductance properties of the affected parts of the brain, resulting in gross decrements in visual performance. There are some criticisms of that work by Köhler, some rebuttals, but the issues were never fully resolved.

Recently, though, Spillmann and Eh-

renstein (1996) have argued that modern visual neuroscience is rediscovering much of the classic Gestalt work and reanalyzing classic Gestalt phenomena.

- S: Bartlett's 1932 work on long-term memory, in which he showed reconfiguration in the direction of gist, brevity, and personal belief, implies a major influence of dynamic neurological activity on long-term memory. Would this work be better construed from a Gestalt or an information-processing perspective?
- W: Does the Bartlett work fit the Gestalt notions? I believe it does. In fact, there's the classical Wulf (1922) work on leveling and sharpening, which was directly in the Gestalt tradition. Long-term memories change by becoming "better Gestalten." The Bartlett work really is very similar. There's simplifying, but keeping the same basic structure. In successive reproductions the gist, for instance, of a story is in some ways retained, at least from one version to the next, so that there is a logical, understandable connection between each of the successive versions of the story, but when you get from the first to the eighth, or something like that, it might have been radically altered—in the same way the visual hieroglyph of an eagle can turn into a kitten and that in turn can become a bag, in successive reproductions of visual line figures in Bartlett's study.
- S: It seems so fundamental that long-term memory is dynamic; it's not just static storage. That was a critical demonstration back in 1932. Why has there been resistance to this idea in the field?
- W: I'm reminded of the currently controversial work on constructive memory, such as that of Elizabeth Loftus (e.g., 1979), which obviously fits the idea of a dynamic memory. Memory in a computer is a literal retention of what was punched in. Memory in human beings is probably an entirely different process, a residue, which is not unalterable, of what was considered most salient about something that happened in the past. And then there is Ulric Neisser's (1976) notion of the constructive quality of memory. Probably every case of real recall is a reconstruction or a construction. Maybe that makes it less surprising that it should be hard to distinguish between real memories of events and ones that are induced by various experimental techniques, such as those that Loftus and others have used.
- S: When you think about the physical basis of memory—the engram—you run into a real problem in invertebrates. *Paramecia* can learn. They have no nervous system at all, and yet they can learn, at least in a minimal way.
- W: William James in 1890 pointed out that even a nail can learn; so can a folded piece of paper.
- S: In the sense of retaining a physical record, the hammer blow or the fold?
- W: Yes. If you bend a nail and straighten it and then try to hit it in again, it's most likely to bend in the same place—and the same with a folded piece of paper: It folds more easily along a crease where it's been folded before. Memory is not something that is peculiar to nervous systems if you define it in particular ways.
- S: It's also fascinating that we replace the molecules of the brain itself. Every 2 or 3 years, you're effectively, physically, a completely different human being, at least at the molecular level. For a while I was engrossed by Roger Penrose's (1989) notion of memory as residing in quantum mechanic states—until I realized that for years the computer was the most complicated machinery that anybody used to simulate memory, or that people even understood fairly well. Well, now quantum mechanics is the most complicated set of phenomena we understand, at least to some rudimentary degree, and that's why it is enticing as a possible explanation of memory: not because it's necessarily true, but because its complexity makes it really neat, aesthetically pleasing. It comes down to a very simple question with an extremely complicated answer: the question of what memory really is.
- W: Karl Lashley, in 1951, pondered the number of neurons in the brain and the number of all of their connections, and calculated that there might be barely enough units and connections among them in the adult human brain to account for the playing of perhaps the first five or six bars of a mem-

orized violin sonata by a violinist. Clearly, the modern conception of memory is wrong, in terms of how it works in the brain or how it could work in the brain. But it's not surprising that one keeps using whatever the currently popular technical metaphor happens to be. It's the metaphor that's most salient at the time, from grooves, neural grooves in James, to telephone wires and switchboards, through the vacuum tube to yes-no switches in computers.

- S: But ultimately, the current ideas about memory, the current metaphors, are largely static. Memories are viewed as unchanging records, and the necessary neural hardware as some sort of glorified electrochemical filing cabinet. And yet there is clear evidence of the dynamic character of memory, which implies that the physical basis of memory, whatever and wherever it is, must have a similarly slippery, dynamic character, at least at some level of representation. There may be a powerful clue to the nature of memory in the dynamism noted by earlier investigators.

Memory and Reasoning: A Gestalt Perspective on "Chunking," Organization, and Learning

The concept of memory is one that lends itself to projective thinking. Memory is practically a Rorschach test for experimental psychologists; where one school sees a series of discrete, boxlike stores with which Wilhelm Wundt or the early structuralists would have been comfortable, and which mimic a modern computer rather precisely, another camp sees a free-flowing dynamic system whose components, if any, are effectively irrelevant to the continuous process of memory itself.

And yet, at base, there must be some physical and functional reality to memory that transcends the projections of its theorists. Memories exist; of this there is little doubt. Therefore, some form of process that leads to memory, and that maintains and retrieves memories, must have at least an epiphenomenal physical and functional existence. Thus, it should be possible, although admittedly difficult, to comprehend memory in an absolute sense.

Any reasonably objective theory of memory requires an understanding of how memory, and memories, must be organized. Yet, the question of memory organization has often taken an intellectual back seat to the more mechanistic questions of how much memory stores can hold, how many hypothetical stores exist, where the possible dividing lines among these stores actually are, and so on. Gestalt psychology takes the opposite tack, being more concerned with the way in which material is organized into meaningful internal Gestalten than with hypothetical models of putative structures. Although this organizational focus was somewhat obscured during the heyday of artificial intelligence models, it may have some powerful utility for today's more organismic, less machine-like conceptions of the memory process. Indeed, without such an organization-based focus, it may prove extremely difficult to construct workable models of memory at all.

- S: Getting back to the concept of isomorphism and insight at a functional level, as opposed to the hypothetical neurological level: The concept of insight seems to have a lot to do with understanding the meaningful character and relationships of stimulus items. A "chunk" in short- or long-term memory consists of a group of elements that are related in a manner that is at least idiosyncratically meaningful. Can the notion of insight account for the concept of a chunk, or of chunking in general?

W: I think it might be useful to turn that question around. Can chunking account for insight? I think the way you put it, that a chunk is idiosyncratically meaningful, may be critical. Chunking in the classical sense doesn't contradict the idea of insight. Consider the Ericsson work (e.g., Ericsson & Chase, 1982) on what seems like phenomenal memory—for a series of as many as 80 randomly generated digits. The memorizer chunks them into meaningful units such as times for running a hundred yards, a particular date, and other meaningful numbers like that. Insight is being used by the person to try to memorize the list, by imposing meaning on a random series of digits, and in that way creating chunks.

Yes, the meaning, the insight, used in coding the series in terms of speeds or dates is a basis for the chunking. For such a purpose, the chunking must have meaning. Most chunking, though, in the way I read that literature, is not based on such meaningful relations. That is, the subparts of the chunk are usually not as related to each other as a Gestalt theorist would like to have them be if a given chunk is to be a meaningful Gestalt.

S: It's almost as if you basically have two "pipes," two processing systems, one for "gestalttable"—if I can coin that term—gestalttable elements that can be grouped by insight, and another one for all the other input out of which you can't make an insightful unit but which you've got to hang on to anyway. I don't know if the system would be dichotomous or continuous.

W: There probably would be some continuity between them. I think some Gestalt theorists might say that your second "pipe" is largely an artificial creation of the psychological laboratory. In real life—at least until recently, before there were all these idiosyncratic computer programs with the arbitrary conventions the user has to memorize in order to use them effectively—and in good education, there's next to nothing in the second pipeline. Almost everything is in the first. Sure, a pupil might become aware of certain things that some people are talking about which for that pupil are to start with not yet in the first pipeline. For instance, a youngster hears for the first time that there are such things as numbers. They have some interesting relations, the teacher might say. Okay, now something is barely started in the second pipeline, and the teacher's task is to show the beautiful interrelations among these things, so as to move them into the first pipeline. Good teaching avoids rote and drill and memorization; such meaningless processes characterize the second pipeline. What's in the first pipeline is all based on at least some degree of understanding.

Good teaching consists of getting the pupil from a second pipeline type of situation, perhaps about an area that might not

be interesting to the pupil simply because it's still in the second pipeline, into the first; the teacher needs to know the transformation rules to make that happen, to understand how the pupil sees the material, and help the pupil make the transition (see Wertheimer, 1989b) which brings the material squarely into the first pipeline.

S: Which in itself would be another Gestalt.

W: In a sense, yes; it's transforming a fuzzy, undifferentiated, unintegrated meaningless conglomeration into a good clean Gestalt. I think that's one reason why Max Wertheimer used—and enjoyed—the many concrete examples of productive thinking that peppered his lectures, because all of them illustrate the transition from some undifferentiated, unclear, fuzzy, woolly conception of a problem to a nice, clean, clear understanding of it.

Going back to chunking, in order for it to be useful for memory—and this also holds for the work of George Katona (1940)—it has to be based on something other than arbitrary or random connections.

S: As for puzzle solution or problem solving, the Gestalt perspective emphasizes some functionally useful similarity between a new puzzle and familiar ones: You did *X* to solve problem *Y*, and now some version of *X* can be used to solve similar problem *Z*. How is similarity determined?

W: In this area, "similarity" requires an identity of the crucial characteristics of the structure of the problems—the "radix" of both. This issue is related to a lengthy exchange of correspondence between Max Wertheimer and Edwin G. Boring on the concept of isomorphism (King, Bradley, Dalla, & Wertheimer, 1991). Boring was convinced that isomorphism means that there's an identity of the elements in two domains that you can map on to each other. But that certainly didn't fit Wertheimer's conception, for example, of a circle made out of dots. If you have 22 dots in one circle and 24 in another, they are still perfectly isomorphic, even though you can't map the elements on to each other. There is similarity between the circles in their "circle-ness"—identity in the circle-ness (the old Ehrenfels form quality) but

not in the particular number of elements. Similarity is something crucial beyond the sum of the elements themselves. There are certain features of the display or situation that aren't crucial, that are perfectly legitimately variable, such as the number of dots making up the circle (as long as there are quite a few of them).

- S: Suppose an organism is confronted with something completely new, where it doesn't know the rules at all. Such a situation lacks meaning initially, doesn't it?
- W: Probably so, and if it's really completely new, the poor organism probably won't have the faintest idea about how to cope with the situation.
- S: Let me make up a fictitious example. You're a paleolithic person in a tribe that for some reason herds llamas, so you've gotten used to dealing with llamas, which may be obnoxious but not lethal. Then you're suddenly confronted with a woolly rhinoceros, which you've never seen before. Well, it's woolly like a llama, but if you treat the rhinoceros as a llama it tramples you to death. What I'm getting at is that mature organisms have to have the ability to learn something that, to them, is completely meaningless, even though perhaps they usually aren't confronted by meaningless things.
- W: But the woolly rhino is not completely meaningless, as you're implying. The first reaction might be, wow, this is an awfully huge llama—with a horn on its nose. Let me react toward it as though it were a huge llama. Then it turns out that the animal doesn't respond in the same way to my behaviors in which a llama would. So I decide that I'd better try something else, which is still unlikely to be purely random or blind. Organisms tend to use a meaningful, reasonable type of generalization in their reactions to a situation, even if it is quite novel.
- S: In general, then, mature organisms are rarely confronted by things that are absolutely new. But in the psychological laboratory, they often are. Is the study of learning in the laboratory generally a quintessentially atypical process?
- W: All too often, yes.
- S: Is that a fair characterization?
- W: I think so, and Ulric Neisser (1976) has made a similar point about typical studies of memory. Unfortunately, I think probably most Gestalt theorists would agree with that. Max Wertheimer was once given a tour of rat learning laboratories at Yale University when he was there giving a lecture in the mid-30s. He commented that apparently what was being studied there was the learning of prisoners, since the studies used rats in cages. He was making basically the same point you are, that many lab studies of learning are "quintessentially atypical." I don't remember Max Wertheimer ever saying it explicitly, but I'm sure he would have concurred that the classical behaviorist study of learning has very little to do with real learning in real people or real animals in real situations.
- S: The basic purpose, of course, was to derive major principles which transcend the rat, or the cage, or the situation. The research was theory driven, as is virtually everything that's regarded as mainstream in psychology today. But it sounds as if the Gestalt theorists, given domain and situation specificity, were arguing that one should be operating in a much more data-driven environment.
- W: You have put your finger on a crucial aspect, I think, of Gestalt methodology. In fact, that was the main fight with the structuralists and the main fight with the behaviorists. Let the phenomenon itself determine how you study it. Be data driven, not theory driven. Don't impose your theoretical preconceptions on the way in which you do your work. Let the real world drive the research. That's the basic notion of the philosophy, the epistemology, and the methodology of phenomenology. What are phenomena themselves, inherently? Let them tell you what's going on. Let the picture that's at a slant determine your straightening it out. The theories that people use turn out to be fads, and they change over time. If there's one lesson in history, it's that yesterday's theory and yesterday's problem is today something to laugh at.
- A good scientist, as Robert B. MacLeod once wrote (1975), is someone who exer-

cises disciplined curiosity, and for that you have to be a good observer and notice things, not impose your theory on them. Observe phenomena and things that are inherently interesting. Try to understand them.

The Place of the Organism in Gestalt Psychology

So far it has been emphasized that the principles governing problem solving and productive thinking are domain specific within Gestalt theory. It should not be surprising that Gestalt principles tend to be regarded as to some degree organism specific as well; Gestalt psychologists never subscribed to the idea that humans and infrahuman animals are all identical as exemplars of the same general, inclusive learning principles. For the Gestaltist, rats, pigeons, humans, and other animals behave differently, with reference to different sets of ecologically and organismically mediated resources and exigencies. Even within the human species, domain specificity is ubiquitous, as demonstrated, for instance, in the Gestalt perspective on formal logic.

- S: The organism contributes to its learning, to its problem solving. In 1973 Jenkins and Moore demonstrated that when a water-deprived pigeon learns key-pecking, using water as the unconditioned stimulus, the animal actually makes the full-blown consummatory response that pigeons make when they drink. The pigeon, effectively, is drinking the key rather than pecking it. So it would appear that the meaningfulness of associations is something that's carried with the organism either by virtue of its being a particular type of organism or by virtue of its own idiosyncratic experiential history.
- W: The general principle is one that runs counter to the classic Skinnerian view (e.g., 1938) that you can hook anything with anything else equally easily. There are some inherent "associations" dependent upon the nature of the organism and upon the way it's "wired." Some connections may also be dependent on the particular learning history of the organism. There may even be critical periods for the

latter, such as in the generation of phonemes in a foreign language. The lore is that unless you learn a foreign language before puberty, you will never be able to generate its phonemes in ways that are indistinguishable from the way in which those phonemes are generated by native speakers.

- S: Interesting. There is evidence that it is easier to acquire a second language in adolescence than in childhood.
- W: Yes, that fits with what I have heard too. The data, in general, appear to support that conclusion. Counter to the intuitions of most foreign-language teachers, and of most people who have had experience with foreign languages, learning them is easier for older people than for young children. But this concerns linguistic features like vocabulary and grammar. The pronunciation seems to be another matter; phoneme generation seems to be different. People who learn a foreign language after puberty rarely if ever learn to be able to speak it without an accent. They may speak it grammatically, superbly, and use the vocabulary in a marvelously articulate and close to perfect way, but they'll always be recognizable as foreigners because of the way they pronounce it.
- S: If you are a behaviorist or a strict adherent of an information-processing perspective, you might argue that Aristotelian logic is an organismically mediated characteristic of the human mind, and one can study that, as a species-specific characteristic. Would the Gestaltists argue something like: Aristotelian logic is an invention of the human mind that is sometimes used and sometimes not?
- W: I think so. To elaborate a little more, Aristotelian logic is an ideal invented by the human mind, and much human thinking approximates it somewhat, but by no means always. It depends, among other things, on the reasons why the thinking is occurring in the first place. That's one of the things that's discussed in *Productive Thinking*: Aristotelian logic may be an ideal to aim at, but it is not a description of most actual human thought.

For that matter, Max Wertheimer hoped to produce what he called a Gestalt

logic. He regularly gave courses in logic in Germany at several different universities; most of the course was on the classical Aristotelian material, but the last few lectures typically addressed the idea that it really doesn't describe human thought as it usually actually occurs. One of the main points was that classical logical theory leaves out the fact that most human thinking and problem solving does generate something for the thinker that wasn't there before—which is something that classical logic isn't supposed to do (Wertheimer, 1920, 1925).

Some Practical Applications of Gestalt Theory

As discussed in some detail earlier, Gestalt theory has a variety of important applications and consequences for modern psychological theory. As we enter the 21st century, however, with its ominous and increasing levels of human population, environmental degradation, and frenetic quality of life, it is reasonable to examine any psychological theory from a pragmatic as well as an academic standpoint. What can Gestalt theory actually do for us? What are the practical uses of this perspective in dealing with a host of increasingly complex, and increasingly pressing, global problems?

- S: At various times in human history and prehistory, the greatest threats to human beings have come from plagues, predatory animals, famine, even weather. But with about 6 billion people on the planet at this point, it seems that maladaptive human behavior, in its various manifestations, is probably the greatest threat to human survival. Is Gestalt thought relevant to such questions as overpopulation and resource depletion? Could you give an example in broad general terms of how Gestalt concepts could be utilized in one of these more applied areas?
- W: Well, let's take overpopulation, which, from my perspective, is probably the core, the most crucial, issue facing humanity in the transition to the 21st century. What's critical is to get people to view their behavior in the context not just of me and my spouse, or me and my family, but beyond

that to me and my community, my nation, and the world. If you take different perspectives, different ranges of Gestalten, into account, personal decisions such as whether to have another child are not irrelevant to the problems of the world at large. You can have a literal truth which is false in a larger context, and vice versa of course (Wertheimer, 1934). Try to see your own everyday real behavior in the context of the worldwide issues that it may actually affect. Human society is, in that sense, a Gestalt, and one can look at human society on the globe as a whole, in the sense that what happens in one little part over here is going to affect what happens over there too.

- S: Is there a way to foster that view of the world? Is there something that can be done within a Gestalt perspective?
- W: Think through things in honest detail: What are the consequences of various alternative realistic actions in a given situation? What systems, realistically, might various alternative actions affect, and how? Rather than blindly staying in just one perspective, try to step back and see into what other Gestalten the various alternatives fall in terms of their consequences. Again, it's got to be domain specific, unfortunately. There aren't any general principles other than to think through as honestly as you can how this part, this particular action, is likely to affect other things, such as the problems of overpopulation and resource depletion.

Even without complete information, one can often make realistic estimates—conjectures—about what is apt to happen and how it's apt to affect other things, even if the full information isn't available. Consider the mushrooming of new expensive tall houses right next to each other in what used to be open space separating major urban centers just during the last few years. For most people who have been living in those areas for a while, that's undesirable. Why? Well, it's partly enhancing the density of the population, increasing the traffic, removing the open space and the good air that used to be part of living there. If we want to keep the relation between the individual and the

environment in suburbia—and ultimately worldwide—as optimal as possible we've got to do things that counteract that growth tendency, which is intimately related to the deterioration of everyday life for the average person in the world. It follows, not in terms of Aristotelian logic but Gestalt logic, that you've got to do something about the core problem that's generating the difficulties in the first place: overpopulation, the production of more new human beings than the planet can reasonably support with its limited resources.

S: And yet people often have ideas that are contrary to what appears correct in an objective sense: ways that minimize, for example, environmental degradation or turn it into something positive in the mind—huge housing developments as desirable progress rather than as a blight on the landscape. How do the Gestalters handle the situation of a person's ignoring objective data, or for that matter of delusional systems?

W: People try to make sense out of what look like anomalous experiences in a variety of creative ways.

S: So perhaps the delusion of the schizophrenic, then, is simply a question of making sense out of things, but with cognitive fragmentation and loose associations?

W: Usually probably not. Usually doing that in a way that is internally perfectly consistent. It's not fragmentation necessarily.

S: When I was doing work in a psychiatric hospital, I once had three Jesus's, people who had that delusion, who accidentally wound up in the same room. Two of them got in a fight because the other one had to be an imposter. The third simply metamorphosed into Miss America. Internally it's consistent, but . . .

W: All people try to make sense of their world. The psychotic's sense usually ends up as a structure, a Gestalt, that happens to be in major conflict, in significant ways, with the Gestalten that other people who are not considered insane have. In his work on paranoia, for instance, Wertheimer's student Heinrich Schulte in 1923 emphasized what he called the "we feel-

ing." For various reasons, paranoids probably don't have that "we feeling" as part of the Gestalt quality of their self-concept to the same extent that normal members of the community have. They see themselves, often realistically, as isolated, as different, as excluded. The "we feeling" is far weaker in the typical paranoid than it is in the non-paranoid.

S: So the delusions of power and grandeur would then be compensatory for the absence of the we feeling?

W: Maybe so. A result of its absence. That is, they see that they are being excluded and that therefore the world is hostile to them, so that they have to defend themselves. That's part of what may make them dangerous.

S: And so basically when you do exclude them, when you stick them onto the acute unit at the psychiatric hospital, you may massively enhance their feeling of isolation.

W: Yes.

S: Which is going to exacerbate the symptoms?

W: One would expect so.

S: There is now some evidence that schizophrenia may have a better prognosis in some tribal societies, in which presumably this "we feeling" would be enhanced, than is the case in the West.

W: Yes, that would make sense. It's all consistent. And it's also consistent with some very disturbing figures that Charles Kiesler published in the *American Psychologist* in 1982. The prognosis for people who are put into a mental hospital is poor; they typically do worse than controls who are not hospitalized.

A Gestalt interpretation of paranoia is at least one potentially constructive explanation of why paranoia occurs. The only way in which some persons can make sense out of an event in their lives is to realize that there's something terribly wrong with their world or with them, and so they act accordingly.

In Summary

S: Gestalt psychology seems to have immediate relevance for a number of subfields

in psychology. Why isn't it used more widely, made more available?

- W: Why isn't Gestalt psychology being used? The history of ideas, of science, of psychology is a history of change. Some people point to progress, and in a few technical areas, progress has indeed occurred. But problems that are the focus for a decade or so in a given field, including psychology, theories that happen to be in vogue at a given time, are in vogue largely for external reasons. From the perspective of time, unfortunately, most theories really can't be viewed as much of anything other than a fad. In general, history teaches that things change. One may be tempted to think of change as progress, but from the perspective of history it isn't necessarily an improvement, but only a change.

And fads change. Attention to problems changes, often not because the problem is really solved, but because the problem is no longer of interest. Different questions come into the limelight. People with different theoretical orientations end up in significant power positions, and that determines what kinds of offspring there are in terms of graduate-student orientations. The popularity of theories changes over time as the positions of the people in power, over time, change; thus, Wolfgang Köhler, for instance, held the most prestigious chair in the German-speaking psychological world during the '20s and early '30s, and people paid attention to Gestalt theory. Clark Hull had a major chair at Yale, Edward Tolman a major chair at Berkeley. Those were centers of power academically, and it's partly because of that that those people and their theories became so famous.

This may be a much more disillusioned and skeptical conclusion than a proper Gestalt theorist would draw. I believe that the ideas of Gestalt theory, systems theory, whatever one wants to call it, had and still have tremendous potential utility, but for various external institutional reasons people are no longer taught about those concepts and those ways of thinking to the same extent that they were when several Gestalt

psychologists happened to hold fairly powerful positions in academia.

- S: Would you use the term "systems theory" in psychology as a synonym or near synonym for Gestalt psychology?
- W: At best, a near synonym. There are many different holistic theories. The historical argument is that Gestalt theory was successful because it was not only holistic but also scientifically rigorous, which was something that was valued in society at the time. However, the institutional argument may be at least as convincing. That is, Köhler was visible. Max Wertheimer was considerably less so, but still visible. For various external reasons, these people were considered important by their colleagues at the time, so people listened to their ideas.

Actually, there is currently a rather substantial resurrection of interest in Gestalt concepts, at least among some prominent people in cognitive science. Mary Henle (1989) argues that much of it is inaccurate, in that many claims of similarities of current concepts to classical Gestalt ones display a basic misconception of the old classical Gestalt ideas. And yet there still is some continuity today. There are some people who call themselves Gestalt theorists, or at least they're aware of the heritage of Gestalt theory and conscientiously try to use it in visual neuroscience, in cognitive psychology, in social psychology, and even in psychopathology and psychotherapy. The journal *Gestalt Theory* is publishing articles on a wide array of topics.

- S: What are the most important points of the Gestalt legacy for experimental psychology today?
- W: There are a number of them. First, don't make your experiments so artificial that you can't generalize from the world of the laboratory to the real world. Second, of course, is the old Brentano argument: Do what Franz Brentano called crucial experiments, experiments that really get at the heart of different points of view about the same phenomenon and can help you decide which point of view is more promising or veridical. If you're going to do experiments, choose some phenomenon

that's of inherent interest, and don't work on something just because other people happen to be working on it. Choose something that is potentially of interest about the way in which humans and other organisms function. Then make sure that you think about it in a straightforward, productive, open way, enough so that you get at the important variables, the critical things: what's really going on here. Don't assume that the same principles or laws will apply to all organisms and all situations: Many processes are domain specific and organism specific, and most phenomena are profoundly affected by the context within which they occur. Let the real-world phenomena drive the research. You can test your understanding of what's really going on by seeing whether various things happen, when you make crucial changes, in the way that they should if it works the way you think it does. Step back; keep your feet firmly planted in the real world, in real experience.

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