

# METAPHOR, RECURSIVE SYSTEMS, AND PARADOX IN SCIENCE AND DEVELOPMENTAL THEORY

*Willis F. Overton*

DEPARTMENT OF PSYCHOLOGY  
TEMPLE UNIVERSITY  
PHILADELPHIA, PENNSYLVANIA 19122

- I. INTRODUCTION
  - II. MURRAY'S AND SCHOLNICK'S COMMENTARIES
  - III. SUMMARY
- REFERENCES

## **I. Introduction**

In the article "The Structure of Developmental Theory" (Overton, this volume), I argued that the way we decide the value of any theory depends to a significant degree on abstract philosophic assumptions that we bring to the evaluation. Specifically, I claimed that the assumptions of ontological and epistemological realism set one context for theory evaluation; the assumptions of epistemological rationalism or interpretationism set a different context. My general point was simply that the rules define the game, and decisions about whether a game is being played well or poorly necessarily require understanding of the rules. A North American who watches Europeans play "football" can be excused for thinking that Europeans play poorly—indeed insanely—if he is not aware that the rules of North American and European football differ significantly. A realist who watches a rationalist play "science" must have similar unkind thoughts.

I situated my exploration at this particular abstract level of metatheoretical assumptions primarily for three reasons. First, I wanted to show that it is only at this level that it is clear how the rules of the game called science and those called developmental psychology are necessarily interrelated. For example, it is not

accidental that a realist understanding of science and a realist understanding of development combine to support the position that theory is secondary to, and inconsequential in the face of, empirical observations. Similarly, a rationalist understanding of both science and development supports the position that empirical observations, while important and necessary, have no such *privileged* status.

A concern about what developmental psychology will accept or not accept as legitimate scientific explanation was my second reason for basing my exploration at this level. It is impossible to overemphasize the point that realism demands that ultimately all explanations in science must be phrased in the language of material causes (e.g., “hardware” explanations, “semantic” explanations, “heredity,” “efficient” cause, “proximal and distal” causes, “social and cultural determinants,” “stimuli”). Rationalism or interpretationism, on the other hand, asserts that there are levels of explanation that require pattern explanation (e.g., “structure,” “design,” “formal,” “syntactic” explanation) as an irreducible and necessary feature of the game of science.

My final reason for situating the discussion at the level of the metatheoretical assumptions of realism and rationalism is that I wanted to try to fill in, and expand on, some of my earlier writings on related topics. These earlier writings, as Ellin Scholnick rightfully points out in her excellent commentary (Scholnick, this volume), examined the role of metaphor and world views as they influence conceptual, theoretical, and methodological approaches to developmental psychology. In working on the “Structure” chapter I believed that by moving to the higher (i.e., more abstract) ground of philosophic realism and rationalism I might, to repeat a theme that runs through that article, introduce greater coherence, generality, and plausibility into my earlier stories.

## II. Murray’s and Scholnick’s Commentaries

Both Frank Murray and Ellin Scholnick have presented very thoughtful commentaries. Most of Murray’s commentary (this volume) details several specific elements he argues would be required for a “satisfying” theory of development. In general, I find nothing to quarrel with in the list of 10 “categories of information” that he suggests are important for maintaining a “sentiment of rationality” about a theory of development. My own list might drop some of these categories (e.g., “the theorist”) and it might alter the meaning of some others (e.g., “reductionist mechanisms”). However, I would certainly agree that any theory that is going to find wide acceptance must ultimately present the reader with much of the information contained in these categories.

If I were able to enter directly into a dialogue with Murray about his commentary, I would focus attention on the argument that ultimately, decisions about what is rational are determined by emotional responses; hence the need to generate a sentiment of rationality concerning any theory. I suspect that Murray would not

want to press any narrow interpretation of this position because it leads directly to the worst of subjectivism and solipsism. If Theory x is a good or bad theory because of my emotional response to it, and Theory y is good or bad because of Murray's emotional response to it, and Theory z is good or bad because of your emotional response to it, we have no basis for making comparative evaluations among the theories. Further, you or I can dismiss Murray's 10 categories out of hand because they are based on his "feel" and not your feel or my feel. It is exactly this problem of extreme relativism and subjectivism that, as I described in my chapter, led to the attacks on Kuhn's proposals about the nature of science. An interpretationist position avoids this problem by developing an interlocking set of criteria, including empirical observation, that increase the coherence and hence the stability of the overall system.

It is possible, of course, that Murray would reply that we will one day find out exactly what determines or causes an emotional response. This discovery would then provide a common standard from which to make evaluations about the quality of judgments a person makes and, hence, about the quality of a theory that is based on the person's judgments. Although this argument avoids solipsism, it also lands us directly back in the context of metaphysical and epistemological realism. That is, the argument maintains that in the future theories will in fact be reduced to specific material causes (i.e., emotional responses). However, it is only realism that demands that ultimately all explanations in science be phrased in the language of material causes.

It is also possible that Murray would argue that he did not intend such a narrow interpretation of rationality. In fact, at one point he suggests that the emotional response itself may derive from preference. Here, however, we have the case where the choice of a theory is based on the sentiment of rationality that, in turn, is based on an emotional response that, in turn, is based on a preference. And how are we to understand the nature of this preference? Is preference itself to be explained by some particular material cause(s), or is preference based on some set of interlocking reasons? These questions return us again, at a new level of analysis, to the conflict between realism and rationalism, because whichever answer is given, that answer is consistent with one position and not the other.

My general point here goes beyond a dialogue with Murray about his specific comments. The point is that there seems to be no way of reducing rationalism to realism, or vice versa, unless this reduction is done from a rationalist, or from a realist, perspective. An important implication of this general point is the idea that a movement beyond contradiction—which both Scholnick and Murray would like to see—is not possible. No matter what level of abstraction one uses to develop an analysis of the problem, the "other" position asserts itself as a potentially viable but contradictory frame.

Compromise, in the sense of eliminating contradiction, is possible if and only if the core integrity of the "other" position is destroyed in the process (see Overton, 1984). But this is exactly the process of attempting to use one position to reduce

---

the other to its tenets. Within this process, I certainly can offer and have offered (Overton, 1984)—from an interpretationist position—a compromise. This compromise permits, in fact demands, the integrated features suggested by Scholnick including synthesis and analysis, whole and part, universal and particular, change and stability, and emergence and continuity. While the compromise eliminates contradiction at the level of analysis offered, the realist, when he moves to the next higher level of abstraction, notes that this compromise stands in contradiction to his own basic principles.

Specifically, the compromise that I suggested involves acceptance of the idea that both material and pattern explanation form an irreducible matrix of explanation. The concept of material reductionism or eliminative materialism is totally abandoned in this compromise. When the concept of reductionism is absolutely abandoned, a theory like Werner's, or Piaget's, or Bowlby's provides universal pattern explanations involving the development of competence. Various social learning theories, or Gibson's theory, or Skinner's theory, or neurophysiological theory, on the other hand, provide particularistic (part analytic) material explanations that operate in the context of the universal (whole synthetic) patterns. The problem with this compromise—and the point I am trying to make—is that once the realist moves up one level of abstraction it will be recognized that the absolute abandonment of reductionism has destroyed the integrity of the realist position. In effect, what seemed like a compromise at one level turns out to be a capitulation to rationalism at the next higher level.

Another implication of this inherent and irreducible rivalry between rationalism and realism is the notion that the whole knowing enterprise entails iterations of recursive conceptual rule systems. Recursive rule systems are like stories inside stories, or movies inside movies, or boxes inside boxes inside boxes, etc. (Hofstadter, 1979). Consider the several levels of abstraction of recursive rule systems shown in Fig. 1. Here the aim of the knowing activity is to offer scientific explanations of persons. The ellipses at each level suggest recursive systems, and the bidirectional arrows through the levels indicate that the levels themselves form a recursive system. At the 0 level there is the person to be explained. This is the person of our commonsense understanding or our folk psychology.

At the first-order abstract level of scientific knowing—that of specific psychological theories—some theories offer concepts that describe organisms as operating realists (e.g., information-processing devices). Other theories describe organisms as interpretationists (e.g., assimilation processes, where meaning is a creation that emerges from the activity of the organism, and not a fixed unit extracted from another source).

At the next iteration, or second level of recursion, metatheoretical assumptions frame the context for the theories themselves. Here, for example, it is possible to point to the realist metatheoretical assumptions of Gibson's theory and the interpretationist metatheoretical assumptions of Piaget's theory (e.g., constructivism). At the third level of recursion resides the demarcationist strategies that present the

## KNOWING PERSONS: SCIENTIFIC LEVELS

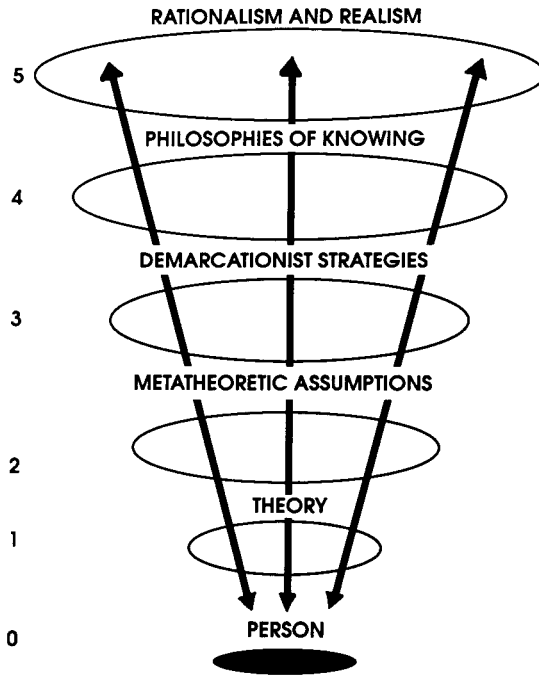


Fig. 1. Levels of abstraction (1–5) of recursive systems of scientific knowing.

rules of the game of science, within which metatheories and theories are formulated. Here the strategies of positivism, conventionalism, and contemporary neo-positivism all reflect the image of realism as it is worked out at this level. The strategies of paradigm-guided research, research programs, and research traditions (Overton, 1984) similarly reflect the working out of the images of interpretationism.

Perhaps the fourth level of recursion is the specific realist philosophies of knowing, or world views, such as those of Locke and Hume, and the interpretationist philosophies of knowing or world views, such as those of Kant and Hegel. Then the fifth level of recursion is the level of epistemology and metaphysics, and these are defined by the concepts of realism and rationalism as discussed in the structure article.

It was, in fact, at this level that I left my analysis in the article itself. That is, I presented this fifth level of recursion, described the contradictions between realism and rationalism, and suggested ways that the fifth level was reflected—boxes

within boxes—at the other levels. In a sense I felt that I had provided a basic conceptual foundation for earlier papers where I had developed ideas about the impact of world views, and strategies of science, on developmental theories and on scientific research methodologies. However, in her commentary Scholnick makes an important point. She suggests that my analysis was, in fact, conducted from a sixth level of recursion, and at that level I was operating wholly from a rationalist or interpretationist position. As Scholnick describes it, even my title—“Structure of Development Theory”—and my basic question—What should a good scientific theory of development look like?—betray my implicit sixth level interpretationist position.

I certainly don't disagree with Scholnick about this. However, I would like to note that this is exactly the “synthesis through emergence” solution to the problem of resolving incompatibilities that she suggests in her commentary. Of course, while the movement to the next higher level of analysis reconciles the lower level, it leaves in place the contradictions at this higher level.

If compromise—in the sense of eliminating contradictions—is impossible, another strategy of reconciliation might be considered. This strategy would accept contradiction, or paradox, as an inherent feature of complex systems and use this paradoxical feature to further understanding. This is somewhat similar to Scholnick's suggestion that a kind of reconciliation could be achieved through understanding contradictory positions on the analogy of reversible figures in which perspectives continually change.

An exploration of this strategy first requires mention of the relationships between metaphors, organismic and mechanistic world views, and rationalist and realist epistemologies. Scholnick suggests that rationalist and realist epistemologies reflect the renaming of the organismic and mechanistic world views that I have discussed in several earlier publications. In an important if incomplete sense she is entirely correct about this. That is, I believe that the metaphor that emerges from the image of organic system and the metaphor that emerges from the image of the machine impact on the formation of those perspectives that are called the *organismic world view* and the *mechanistic world view*. Further, I believe that these metaphors and world views impact on the formation of the conceptual systems called *rationalist epistemology* and *realist epistemology*, respectively. However, it is also the case that at each level of knowing novel systemic features emerge that cannot be captured if the process is thought of as merely that of renaming.

My reasons for using rationalist and realist epistemological terminology were twofold. First, this terminology makes contact with a significantly larger body of both historical and contemporary philosophic and psychological literature than does the terminology of organismic and mechanistic world views. Therefore, the arguments tend to be clearer and more familiar in this context. Second, and more importantly, as suggested earlier, by framing the discussion in the context of

epistemology I thought that a high ground might be established from which to examine the role of metaphor and world views as they impact on our understanding of science, psychology, and development. In essence, I felt that for both of these reasons, the scope and precision of the general argument would be increased by framing the discussion within the context of rationalism and realism. Scholnick's point is that to accomplish these aims I used the organic metaphor and organismic world view as yet a higher level (sixth recursive level; see Fig. 1).

To avoid moving to a seventh level, I will return to a more middle position and consider what this process has been all about. The nucleus of the proposal I have been making throughout this and earlier papers is that, no matter what the level, metaphor is *necessary* and central to the knowing process and to all forms of knowing. Given the context of the "Structure" chapter, then, metaphor is particularly necessary in that form of knowing called scientific knowledge. Metaphor here is not viewed as simply a heuristic device, or simply a matter of taking a concept or image that is used in one domain and applying it in another. Metaphor is a process of knowing. Specifically, it is the process of knowing that proceeds from the known to the unknown, and gives meaning to the unknown. Metaphor is the recursive process that Piaget called assimilation/accommodation, and Heinz Werner called integration/differentiation. It is the act of construction; the act of giving meaning to the world.

If the metaphorical process is central to knowing, then the organization and content of the specific metaphorical entities used in illuminating the unknown are central to understanding the resulting knowledge. From this perspective, the image of the organic system with inherent activity-organization-change, and the image of the machine with inherent reactivity-uniformity-fixity, have each been fertile sources and resources for the elaboration of general systems of thought about the nature of the world, called world views. Obviously, rationalism and realism are a part of the warp and woof of this fabric of metaphor and world views. Rationalism begins from organismic activity in the basic assertion that all knowledge ultimately originates from, and is the product of, the activity of the organism. Realism begins with the assertion of ultimate fixity, invariance, and stability of knowledge, and of its basic independence from the knower.

With this discussion of the relationships between metaphor, world views, and epistemologies as context, it is now possible to describe the strategy of reconciliation between contradictory positions at any given level of analysis. An earlier paper (Overton, 1984), explored the way the several scientific demarcationist strategies (i.e., systems of rules offered as ways to demarcate science from other knowing activities) had been formulated in the context of either a mechanistic realism (positivism, conventionalism strategies) or an organismic rationalism (i.e., paradigms, research programs, research traditions and strategies). The paper further examined the reasons that each strategy either does not admit metaphor and

world views as a central and necessary component of the scientific process (i.e., the mechanistic-realist strategies), or does admit them (i.e., the organismic-rationalist). A schematic illustrating the results of this paper appears in Fig. 2.

This figure again illustrates the view that abstract levels of knowing (i.e., machine-organic, realism-rationalism) influence the formation of less abstract levels (i.e., the demarcationist strategies). For the present argument, however, the most important feature of this figure is the contradiction between the bottom-up analysis required by the realist strategies and top-down analysis required by the rationalist strategies.

Consider what happens to the contradiction between the strategies, however, when a simple transformation is introduced that converts the lines of knowing of Fig. 2 to the recursive cycle of knowing of Fig. 3. Here the top-down/bottom-up contradiction appears as two related components of the same general process not unlike the earlier mentioned recursive assimilation/accommodation and integration/differentiation processes. Similar effects occur for other contradictions. Observations do lead to concepts if one looks only at the part, but only as they are processed through metaphor and world views when one recognizes the whole. Metaphor does lead to observation in a part view, but the observation then influences the metaphor in a whole view.

This transformation also has an interesting effect on the analysis of the demarcationist strategies themselves. Although positivism, with its complete rejection of any scientific value of metaphor and world views, is still a historical

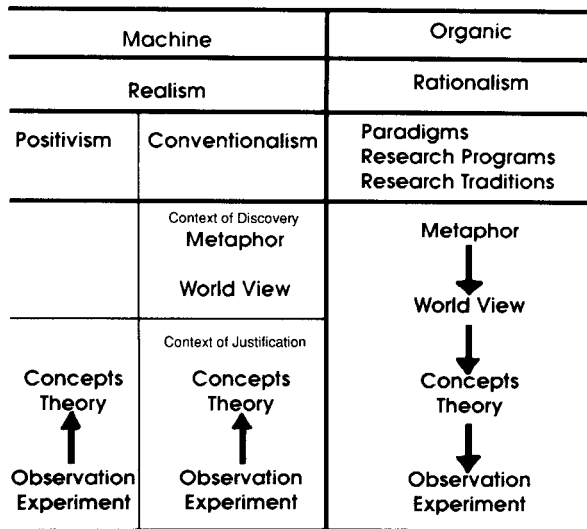


Fig. 2. Lines of knowing: distinctions among several demarcationist strategies in science.

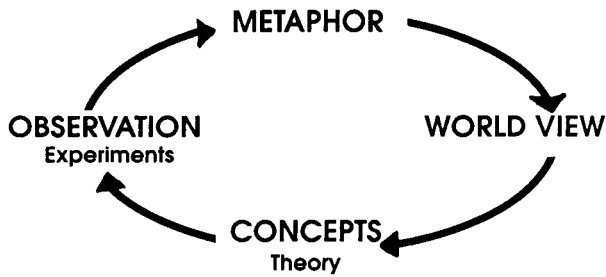


Fig. 3. Recursive cycle of knowing.

aberration from this perspective, conventionalism becomes at least compatible with contemporary research program approaches. That is, conventionalism does not completely reject metaphor and world views but it gives them an epiphenomenal status by admitting them only to an extrascientific “context of discovery.” Once the recursive cycle idea is accepted, conventionalism becomes a true historical antecedent to a strategy that maintains the necessity and centrality of metaphor and world view. Conventionalism’s “error” then becomes that of not recognizing that each component of the cycle is necessary.

The reconciliation of contradiction, then, consists primarily of understanding the contradictory units not as isolated antagonists but as features of the same whole or recursive cycle. This can be done at any level of analysis. For example, Winnicott explored the theoretical question (first level of abstraction; see Fig. 1) of whether the child constructs the mother or the mother constructs the child. His solution was that “the baby creates the object, but the object was there waiting to be created” (1971, p. 89). Winnicott was a strong proponent of using related contradictions or paradox as a positive and creative feature of knowing. He urged that paradox be accepted and respected, and that attempts not be made to resolve or eliminate it.

This reconciliation of contradiction into productive paradox is illustrated in the famous lithograph by M. C. Escher titled *Drawing Hands* (see Fig. 4). Here, a left hand is drawing a right hand, while at the same time a right hand is drawing a left hand. Which hand is doing the drawing, and which hand is being drawn? Both. Are the hands identical then? Yes. Is there any difference between them? Yes, the left hand is the left hand, and the right hand is the right hand. A theory of the left hand, like a theory of the child who constructs the mother, is an important component of knowing. A theory of the right hand, like a theory of the mother who constructs the child, is also an important component of knowing. Bringing the two into a recursive cycle permits a recognition that the one cannot be reduced to the other any more than rationalism and realism can be reduced to one or the other. The paradox stands, and through the paradox the contradiction is reconciled.

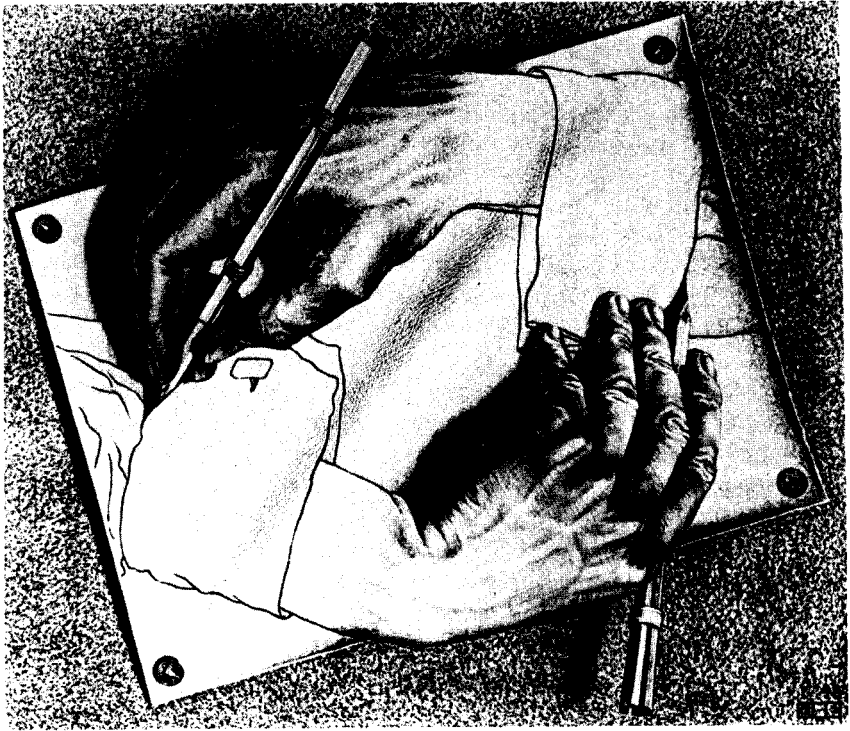


Fig. 4. *Drawing Hands* by M. C. Escher: a recursive cycle. © 1948 M. C. Escher/Cordon Art, Baarn, Holland.

The movement of contradictory elements into recursive cycles is the primary method of reconciling contradictions and transforming them into productive paradoxes. However, no less important to this process is the acceptance of something like recursive cycles as legitimate to all forms of knowing, including scientific knowing. Hegel (see Stace, 1924) identified two modes of knowing, or stages of mind, that he called understanding (*Verstand*) and reason (*Vernunft*). When knowing operates only in accordance with *Verstand*, contradictions must be eliminated, and recursive cycles constitute illegitimate and nonscientific forms of knowledge. When knowing proceeds according to *Vernunft*, contradiction or paradox is maintained as the source of both differences and identities, and recursive cycles find an indispensable role articulating the knowing process.

*Verstand* operates in terms of exclusive either/or categories. Every question put to *Verstand* is answered in terms of either/or. Either the phenomena involved are different and thus they are not identical, or they are identical, in which case they are not different. In this mode categories are static and fixed. In *Verstand* opposites

are mutually exclusive and absolutely cut off from each other. The Aristotelian law of identity holds absolutely:  $A = A$  and it is never the case that  $A = \text{not } A$ . Both identities and differences are considered, but each is taken separately. As a consequence, concepts are *either* identical ( $A = A$ ) *or* they are different [not ( $A = B$ )].

This mode of knowing implicates linear thinking where contradictions are resolved by showing that the one or the other oppositions is mere appearance. Hegel accepts *Verstand* as a valuable mode of knowing. It is the mode of knowing that searches for precision and clear distinctions. It is the mode of thinking that has characterized methods of justification in science. Subject–object, chance–necessity, object–concept, appearance–reality are all important distinctions that need to be made if thinking is not to become fuzzy and lost in vagueness. However, analytic philosophy and positivist forms of science have been trapped in the exclusivity of this mode of knowing, and as a direct consequence they have insisted that this, and only this, mode constitutes scientific knowing.

In *Verstand*, opposites or contradictions absolutely exclude each other. *Vernunft*, or reason, on the other hand, is the mode of knowing that asserts the principle of the identify of opposites ( $A = \text{not } A$ ). Here categories break up and flow into each other. Both modes consider identity and difference, but *Vernunft* rejects the exclusive nonrelational either/or and considers identity and difference simultaneously. Thus, reason requires that opposites be placed in a relational matrix like the recursive cycles described earlier.

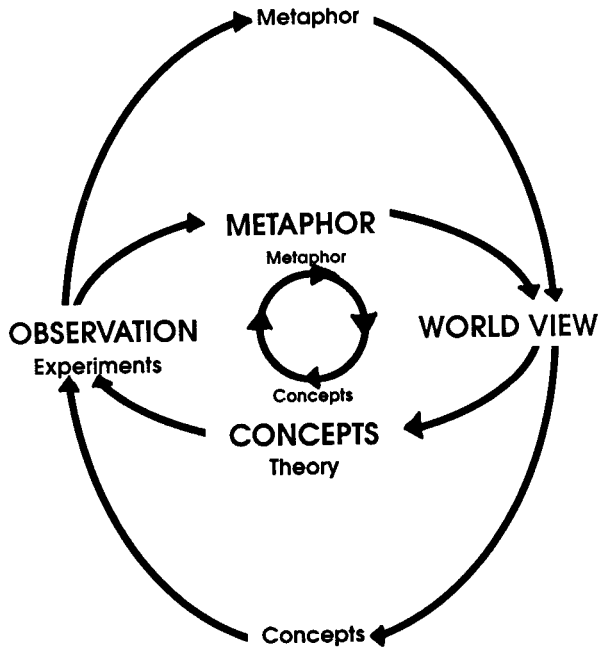
In *Vernunft* what is identical is also different, and what is different is also identical. Categories in *Vernunft* are both identical and distinct. In *Drawing Hands* (see Fig. 4) there is identity; both hands are drawing and both are being drawn. But in identity there is the difference that the left hand is the left hand while the right hand is the right hand. For infant and mother there is identity in that each constructs the other, each provides for the other. But in this identity there is also difference; the infant is not the mother, and the mother is not the infant.

Hegel pointed out that there is no necessary opposition between the understanding and reason. Reason is only opposed to the exclusivity of the understanding. Because it involves both identities and differences, reason includes principles of the understanding. Reason is the mode of knowing that characterizes discovery in scientific discourse and provides the meaning context for justification. Thus, it is the mode of knowing that establishes the legitimacy of recursive cycles as a necessary component of scientific knowledge.

### III. Summary

The contradictions found at any level of abstraction among concepts such as subject–object, whole–part, synthesis–analysis, metaphor–observation, organ-

icism–mechanism, and interpretationism–realism cannot be eliminated or resolved at that level. They can, however, be reconciled into productive paradoxes by recognizing them as components of recursive systems. The resolution of the paradox occurs only at the next higher level of abstraction where a synthesis can be established. However, this synthesis at the next higher level entails its own contradictions. These can again be reconciled into productive paradoxes through the recognition of broader recursive systems. This progressive solution continues at each iteration, or level or recursion, and it is illustrated in Fig. 5. In the figure, the innermost cycle represents the knowing organism, knowing in the paradoxical cycle of metaphor–assumptions–concepts–observations. This knowing organism is explained and hence understood, and the paradoxes reconciled, only by moving to the next level of recursive cycle. At this next level, the first level of abstraction, psychological theories operate to explain the phenomenological knowing organism of the first cycle. In fact, it is only by moving to this level that we transcend the paradox of man knowing and explaining himself. And only by moving to this level do we avoid the vicious circularity that could befall the use of recursive systems. However, the theories themselves involve a new paradoxical cycle of metaphor–assumptions–concepts–observation. Thus, explanation of this level re-



*Fig. 5. Levels or iterations of recursive cycles of knowing.*

quires movement to the next level of abstraction or next outer cycle. Here meta-theoretical assumptions provide the transcendence and the opportunity to reconcile the paradoxes of psychological theory. But this level too operates in a cycle of paradoxes and consequently the process continues as it does for any dialectic process.

In closing, I should in fairness note that I have outlined only one type of solution to contradictions that are found among approaches to the game called science and the game called developmental psychology. It is a solution that draws heavily on the categories of dialectical method, and it is just this method that is both the reason for, and the consequence of, the organismic metaphor. Thus, my solution generates its own contradiction for I have again, as Scholnick argues, based my solution at some level of organicism; a point that will not escape the discerning realist or, for that matter, the discerning rationalist.

### ACKNOWLEDGMENTS

I express my appreciation to the members of the Epistemology, Development, and Psychotherapy Seminar at the Institute of Pennsylvania Hospital where several of the ideas in this paper were first expressed and worked through. Also my special thanks to Harvey Horowitz for our ongoing discussions about epistemological issues, and to Carol Groves, Richard Lerner, Lynn S. Liben, Nora Newcombe, and Mary Winn for critical comments on an earlier draft. To Ellin Scholnick, my thanks for keeping the discussion going.

### REFERENCES

- Hofstadter, D. R. (1979). *Godel, Escher, Bach: An eternal golden braid*. New York: Basic Books.
- Overton, W. F. (1984). World views and their influence on psychological theory and research: Kuhn-Lakatos-Laudan. In H. W. Reese (Ed.), *Advances in child development and behavior* (Vol. 18, pp. 191-226). New York: Academic Press.
- Stace, W. T. (1924). *The philosophy of Hegel*. New York: Dover.
- Winnicott, D. W. (1971). *Playing and reality*. New York: Routledge.