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The Journal of Curriculum Theorizing

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Editor's Note

We open with Bill Doll's provocative and important discussion of change. He leads us from ancient Greece (Plato and Aristotle) to modern Europe (Newton, Heisenberg, Waddington, Weiss, and Piaget), and finally to upstate New York, where he develops a Piagetian arithmetic curriculum. It is an essay that will provoke lively conversation, and some of that lively conversation follows. Paul Cobb, Seymour Itzkoff, Nel Noddings, Jim Wood, and Hugh Mumby all find much to say about Bill's piece, and more specifically, much with which to quarrel.

Speaking of quarrels, I suspected the Reid-Wankowski conversation in 4:2 would start one. Madeleine Grumet reprimands our English friends for "psychologism" ... and worse.

Completing this quarrelsome issue are two fine reviews of Suransky's The Erosion of Childhood. David Smith, the important young Canadian phenomenologist, and Selma Greenberg, the insightful and perceptive feminist theorist, make several telling points about the book.

Rochester graphics designer "Book" has given JCT a cover with which it can live ... finally. Only the photograph will change. Speaking of change, please turn the page.

W.P.

CURRICULUM AND CHANGE: A RESPONSE

James Wood
Sodus (N.Y.) Public Schools

As a teacher, I expect some change among my students during the time they are in my class. I also know that I am subject to change during my classroom life. The change that student and teacher experience is both short, spontaneous, varied, and long, epochal, similar. Many have presented theories about change that attempt to explain lived experience. Professor Doll presents a theory of change concerned with the developmental experience of children. This theory, based on Piaget's interactionism and Weiss and Waddington's biological model of organicism, offers a structural, systemic process that is wrapped in a blanket of intelligent abstraction. In the careful order of this paper, Doll draws the reader away from common notions of Piaget's stage theory and toward a more complete epistemology that honors individual difference. Meeting these individual differences with the help of a new curricular map forms the cornerstone of the paper. In order to analyze the efficacy of such a curriculum, attention must be turned to the rational thrust of Doll's theory of change. That thrust begins with an historical analysis.

Doll's well-crafted history of the main currents of the philosophy of change effectively described the destruction of the classical Greek view that "... can be labeled stable change, or cyclical change ... change [that] is a closed system, always limited by pre-existing boundaries ..." (p.10) The nineteenth century view was a union of Newtonian determinism ("... deterministic, reductionistic, and linear ..." p. 13) and Darwinian evolutionism with its belief in the

perfectability of man through conflict, competition, and progress. The resultant influence of this triumph of ideas was readily apparent in the philosophy of the industrial revolution and the rise of the public school in the United States. It is not hard to see how appropriate it was, in a time of rapid expansion and corporate exploration, for the late nineteenth century school to adopt the prevailing scientific notions of change and apply them to pedagogy for the students of the era. While the schools' functions remained frozen within the nineteenth philosophy of change, prevailing scientific ideas continued to progress. Doll describes the third shift of viewpoint as the modernist view. It was first depicted by Heisenberg's Uncertainty Principle and fully explained by the biologists Waddington and Weiss. Jean Piaget brought the modernist view to the psychological realm with a view of change that sees individual growth as autoregulatory, constructive, hierarchical, internally controlled but externally influenced.

Such an analysis piques interest and stimulates reflection upon our well-ordered notions of the scientific revolution. It demands that the reader probe more deeply into commonsense assumptions of the immutability of change. Doll's analysis offers the thesis that, while the scientific view of change supplanted the Greek classical view, it retained a belief "... in an orderly universe, run by mathematical laws, created by a logical and constant God ... scientific observation was for the purpose of discovering these mathematical laws, which God had created." (p.12) This belief is what characterizes our love affair with science today. It is a belief that has been challenged often. Einstein questioned this absolutist view with his theories of relativity which paved the way for Piaget's constructivist epistemology. Because Piaget was an epistemologist, he brought the scientific debate, already resolved in favor of a relativistic, modernist view in the science arena, to the arena of education.

As Doll would have it, education has relied on the nineteenth century scientific view of change in its adherence to behaviorism. Such adherence ignores the scientific currents of the past fifty years. Even the tiresome behaviorist vs. humanist debate, brought to vivid contrast in the curricular

movements of the 1910's, 1930's, and 1960's, ignored the possibilities of *modern* science. Piaget's organicism does not. It manages to reject behaviorism as behaviorism ignores the systemic processes of organization and construction. Such a theory ignores *all that explains human development.* As a result, behaviorism has nothing to offer education as a theory of change. At the same time, organicism goes even further than process and construction. It enlarges the Gestalt view of underlying structures. What Piaget did that Kohler and Wertheimer could never do, was to give rational human evidence of the systemic constructions of the mind. The evidence, in the form of exhaustively researched documentation of children's structural thinking, laid bare a thought process that grows more logical over time. What is most exciting about organicism is that it offers a rational theory that successfully rejects a behaviorist epistemology. Unfortunately, the linguistic tools that organicism uses to dismantle behaviorism are exclusively abstract, rationalist, and reductionist.

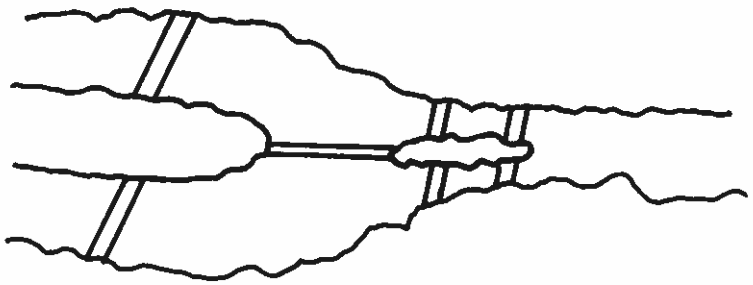
Doll attempts to ground Piaget's abstract psychology and epistemology with the help of a research study in children's arithmetic. Such an effort to give concrete narrative to Piaget's pure theoretic suggests a pedagogy that forms Doll's curriculum. Something is missing. The narrative fails to emerge as a complete illumination of change, because it ignores individual experience. Instead the theory becomes a cloud that shrouds our view of what gives meaning to life for a John or an Otis, a Janine or a Monica. Organicism uses an abstract principle of cognition that explains children's thought as a process of knowledge transfer and an extraction of the generic from particular perceptions. The ultimate knowledge is logical-mathematical-abstract, genericised. In such a process, the child enters into a dialectic with the stuff of the world -- the phenomena. The "entering in" acts to begin the process of empowerment that allows increasing sophistication of classifications of the phenomena.

Such a view creates a model for mind that grows increasingly sophisticated logical-mathematical structures and grows increasingly estranged from feelings about the stimuli that are structured. Passion, the body, emotional commitment and

self-understanding are stripped of their organic, creative, felt basis, and turned outward as logical, competent synthesizers. Yet the curriculum has not removed the creation of such feelings. In fact, Doll talks about noise and confusion leading to the necessary frustration for the formation of new structures. The process of equilibration is essentially a concrete, emotional dilemma for human beings! The translation of Piaget's biological equilibrative process from mollusca to homo sapien is a translation of emotion as well as intellect. Piaget does not recognize these emotional factors. The absence of a construct to explain the emotional components of the translation leaves the intellectual components remote, unreal. The result, for teachers, is a reluctance to create a classroom atomosphere of balanced frustration for want of an exploration of emotional structures to coincide with intellectual structures. Lest I make a similar error and create an abstract facade to front my response, let me give an illustration of such reluctance.

A Teaching Situation

Not too long ago, while teaching a course on problem-solving in elementary education to a group of veteran classroom teachers, I was intrigued by the collective reaction to a problem I had posed. The problem follows:



Directions:

The above sketch represents a river, two islands, two river banks, and seven bridges. Starting anywhere in the sketch, cross all bridges once and only once. All seven bridges must be crossed; do not enter the water.

This problem was given casually to encourage class members to find similar challenging problems and share them with the class. Novel solutions for this problem and others were invited to stimulate future discussion. About two weeks later, upon receiving few nibbles on possible solutions, I brought the problem up for general discussion. To this point, I had no idea what might be a solution to the problem.

During the discussion, struck by the math muse, I blurted out a spontaneous solution: around the world. I proceeded to explain my "around the world" solution. After crossing six of the bridges in any of several ways, one finds oneself on the bank with no available bridge for crossing. It then occurred to me that access to the last bridge was possible if I were to take a very lengthy trip around the world and then cross. My daughter, later in the week, suggested following the river to its source, crossing the river, walking back, and then crossing the seventh bridge.

The reaction to these so-called solutions was unanimous incredulity (although the class was less derisive regarding my daughter's solution). Such incredulity is worth analyzing, but it is not this reaction that is most intriguing. The most interesting reaction to the problem and its solution occurred during the last class meeting. At that meeting, a teacher was presenting her course project. She re-kindled the Euler Bridge problem discussion by stating that Euler had proved that it had no solution. She offered an article in the National Council of Teachers of Mathematics' *Arithmetic Teacher* as a source to strike down my family's ingenuous solutions. Still, this is not the point I want to make. The point is made by observing the reaction to her pronouncement. The reaction was swift and unequivocal: irritation that any self-respecting teacher would offer to students a problem that had no solution. Ignored was the obvious creative energy, logical discussion and shared frustration and triumphs that had resulted from our earlier collective heuristic. Many felt such problems to be self-defeating and counter-productive. I was left pondering what impact the course, with its emphasis on creative, divergent and contextual problem-solving, had had on the participants.

This little digression is all about change, but the tools

Doll's thesis gives do not help to illumine its complexity.

The problem with an organismic theory is not just a phenomenological one, not just an ignorance of the concrete in favor of the abstract or the glorification of the rational over the emotional (an aspect that does little to explain the class response to my treatment of Euler). The problem with the organismic is that it works away from the denial of a feeling self toward the social, but in an unsatisfactory way.

The theory, although ostensibly dealing with social interaction, does not fully appreciate the social dynamics of change. It does not acknowledge the macro-social underpinnings of human change. Such an acknowledgement would recognize the arresting, resisting, and vascillating contexts within which students and teachers change. Nowhere is there a mention of reproduction theory, resistance theory, Marxist theory, or any kind of sociological framework against which to present Piaget's case. Piaget has seen to it to argue his case in such a context (see *Structuralism* by Jean Piaget), but Doll does not. The environment that the child manipulates and explores may be constructed by the child, but it also has a history of previous constructions and academic disciplines that present theories of the collective interactions of its participants. Studies of adults have shown that many never develop logico-mathematical structures. It is implied by Doll that the "fault" for such "failure" is the teachers'. The implication is that if teachers improved their methodology and curricula, all would acquire "the right sort of" knowledge. If Piaget's definition of knowledge is accepted and if the fault for that knowledge's poor distribution is the schools' and teachers', in what ways? Simply stating a new philosophy and curricula to counter outmoded ones does nothing to *change* current practices. The equilibration process is autoregulatory, teleonomic and as such is an eternal given. Children, no matter how poorly teachers teach or how mechanistically school curricula order knowledge, will change via the interplay of equilibrium, disequilibrium, and reequilibration. Only the logically hierarchical aspect of the equilibrative process is not a given. This "enrichment" is constantly interrupted and disrupted.

A new curriculum based on five pedagogical principles, may point the way toward realizing the development of hierarchic formation, but it is doomed to failure without an equally elaborate strategy for unsettling the blocks that function to prevent school reform. The five pedagogic principles, admittedly, are not new. But Doll has brilliantly synthesized the principles to go beyond Bruner, Piaget, and Dewey. It would be nice if such a synthesis were enough. Unfortunately, nothing in Doll's essay, with its omission of any kind of social critique of schools, leads us closer to seeing a more liberative change process encouraged rather than suppressed. However, to Doll's credit, his paper presents an organismic model pregnant with potential. The soul of the theory is a nexus for the social and the individual. Doll's concise conceptualization of this nexus is excellent. He does not go far enough in describing either the individual, filled as it is with emotion, or the social, filled as it is with a network of competing forces that prey upon the individual; but Doll does offer a lens to begin to view children and pedagogy that is both conservative and liberal. The liberative aspect describes the child progressively as one who manipulates, explores, reflects, and makes sense of the world. The conservative aspect views the child as reluctant, settled, comfort-seeking. As Doll suggests, this dialectical process assumes that the child is actively forging a vision of the world. It is a suggestion that offers:

1) Evidence that the child is constructing a novel personal world.

2) Evidence that the child's constructed world becomes increasingly sophisticated (i.e. logical, abstract, and adult-like) given adequate environmental interaction and successful social interchange.

3) A broadened interpretation of children's thinking that is based on systems and structures rather than on retentions and reproductions.

4) A theory of change that goes beyond structuralist theories built by sociologists and anthropologists such as Levi-Strauss and which includes human agency as an equal force in the process of change.

In addition, Doll sees the teacher as curriculum maker.

Such a view raises expectations for both teacher and child. The teacher must become an adherent to the proposition that teacher-student interaction is essential to maximizing logic in the child's cognition. The teacher ascends past the managers, the physical environment, and the written curriculum to become the facilitator who de-centers enough to recognize the child's cognitive structures yet who retains a knowledge of the field so that equilibration is enhanced rather than inhibited.

To do so, the teacher must shed the shackles of dependence. The teacher must begin to make decisions about school change as well as about student change. To Doll's credit, he magnifies the teacher's importance. As a teacher of twenty-two seven, eight, and nine-year-olds, I applaud such magnification of my importance and my responsibility.

* * *

Write me for a conference program. – *Margaret.*

PRETEXT: CRITIQUE OF CURRICULUM AND CHANGE

Paul Cobb
University of Georgia

Doll's essay is one of those all too rare sprawling multidisciplinary marvels. He has created a network of connections among the fields of philosophy, psychology, biology, epistemology, physics, mathematics and curriculum theory. His analysis is a fascinating attempt to both account for the short-comings of positivist curricula and to lay the foundations for a viable alternative. His first thesis is that positivist curricula are, at least implicitly, based on an anachronistic seventeenth century view of change. His second thesis is that Piaget's biological theory of cognitive development is compatible with contemporary views of change. He then goes on to elaborate the implications for curriculum theory. Both theses are supported by incisive, interwoven chains of reasoning. This carefully marshalled body of evidence is, for the most part, conclusive.

In the first section of the essay, Doll discusses the evolution of the concept of change in Western thought. He first discusses the Greek view and relates it to "the belief in I.Q. as a magical element." This nascent psychometric notion was, however, derived from faculty psychology. The early psychometricians merely attempted to quantify certain unfolding traits such as the ability to reason logically. Robitaille and Sherrill (1977) report that the tacit beliefs most teachers hold about learning are variants of faculty psychology. While educational and psychological theorists have entered the seventeenth century, it would seem, then, that many teachers are still in ancient Greece. If nothing else, this demonstrates that some Greek myths are surprisingly durable.

Doll next considers the mechanistic, Newtonian view of change. Here, we enter the cause-and-effect world of the behaviorist where the tyrannical environment reigns supreme. It should be pointed out that behaviorism is an extreme form of positivist or functionalist thought. Information-processing psychology is a less radical but potentially more threatening variant. Unlike the behaviorist, the information processor attempts to understand what is going on inside children's heads. Beilin (1981) demonstrates that the explanations offered are, at base, mechanistic in character. They are little more than glorifications of Hull's stimulus-mediation-response psychology. This should not be particuarly suprising because the S-M-R chain is an extremely good model of the operating of a computer. Unfortunately, unlike humans, computers are not conscious, do not exercise free will, and do not operate contextually (Dreyfus, 1979).

Finally, Doll introduces the sub-atomic physicist's view of change. After a two hundred year quest for the Truth, Newton's ancestors report that they know they can never know, but they suspect that it is One (witness the recent spate of books which relates quantum mechanics and Buddhist philosophy). Doll assumes that there is a close parallel between advances in the philosophy of science and the philosophy of mathematics. However, while physicists accepted the loss of certainty relatively quickly, the reaction of philosophers of mathematics was to attempt to make mathematics certain once more. This gave rise to three competing schools of thought, the Logicists, the Formalists, and the Intuitionists, all of whom eventually failed for differing reasons. Even then, many mathematicians remained true to the Platonist cause. Godel, for example, continued to espouse this doctrine even after he had demolished the Formalist program (Godel, 1944, 1947). No notable advances were made in the philosophy of mathematics until 1976, when Lakatos' classic, *Proofs and Refutations*, was published. Lakatos rejects the Platonic world of ideas and instead focuses on the social process of constructing mathematics. This process can be interpreted as dialectical in character in that it involves the proposal of a proof followed by a refutation (e.g., a counter example) which precipitates

the formulation of a new proof and so on. In Lakatos' view, all mathematics is potentially refutable; there is always the chance that a piece of mathematics which seems certain now might be refuted by a future mathematician. In short, the last bastion of Truth, mathematics, is grounded in the relativist terrain of the social experiences of mathematicians. The conclusion that scientific and mathematical knowledge is fallible leads naturally to Lakatos' and Kuhn's contention that it is constructed by communities of individuals who are committed to the same research program or who share the same world view. [There are, however, important differences between Lakatos' (1970) and Kuhn's (1970a,b, c) philosophies of science.] This claim is, of course, compatible with Piaget's constructivist epistemology. Whereas Lakatos and Kuhn take the scientific community as the unit of their analyses, Piaget focuses on the individual.

In subsequent sections of the essay Doll discusses the four organismic assumptions and then elaborates Piaget's view of change. It is here that I have a difference of opinion with Doll, a dissension which runs throughout the remainder of the essay. At root this disagreement is epistemological and concerns the relationship between internal (or endogenous) cognitive structures and external (or exogenous) stimuli. While he stresses that stimuli do not produce responses but instead affect internal structuration patterns, he nevertheless regards stimuli as existing independently of the child's cognitive activity. This is a rather surprising interpretation of Piaget when one notes that Piaget entitled his analysis of development from birth to the acquisition of language *The Construction of Reality in the Child.* As Piaget puts it:

> ... at the termination of this period, i.e. when language and thought begin, he is for all practical purposes but one element or entity among others in a universe that he has gradually constructed himself, and which hereafter he will experience as external to himself. (Piaget, 1968, p. 9)

Here, Piaget states that the child constructs his or her own universe and then experiences it as though it were external to the self. Elsewhere he says that "... in development, the

passage from one stage to the next is always characterized by the formation of new structures which did not exist before, either in the external world or in the subject's mind. (Piaget, 1970, p. 77). Considerable caution must therefore be exercised when Piaget uses terms such as *exogenous* and *environment*. von Glasersfeld (1982) offers a plausible interpretation: terms such as *exogenous* refer to something that is external or given relative to the cognitive structure in which it becomes involved. The results of lower level cognitive operations can be considered observables or given relative to a higher level, more abstract cognitive structure. For example, the world of sense-objects is given relative to the cognitive structures which account for a child's arithmetical knowledge. This latter knowledge is, in turn, given relative to the child's algebraic structures. At an even more abstract level, the discipline as structured and organized by the teacher appears to be external.

While this distinction may seem pedantic, it has several important consequences. First, children's invariant progression through a sequence of development stages poses a problem for subscribers to the interactionist perspective. As children interact with decidedly different external physical and social environments, Doll has to explain why these environments trigger certain structural modifications but not others. He suggests that "developing systems have a tendency to canalize themselves toward a normal end state, to develop pathways to maturity in spite of disturbances, changes, interactions." The process of canalization would seem to require the specification of an agent which constantly directs the developing system towards the normal end state. It is difficult to avoid the conclusion that this is a watered-down form of pre-formism. though I am sure that Doll would deny this.

I agree that cognitive change is precipitated by experience, but this is experience of the world the child has constructed. From this perspective, similarities in cognitive development can be accounted for by a) the constraints of the *child's* physical and social environment and b) the constraints of the existing cognitive structures at any point in development. Point "a" states, in effect, that the child's current

physical and social environment does not determine future constructions in any positive sense. It does, however, rule out certain possibilities. The child learns from experience that certain ways of operating do not lead to the intended result. The child is like a burglar attempting to pick a lock. While many different keys will open the lock, some certainly will not. Point "b" merely says that the existing structures do limit the potential constructions a child can make.

A second consequence of the distinction between Doll's interactionist position and the radical constructivist position involves the notion of reception learning. Doll suggests that we have a choice between curricula which allow the learner to construct knowledge and those which encourage the reception of knowledge. For the radical constructivist, on the other hand, all knowledge is constructed; it is never received. The radical constructivist also disagrees with the admission that "external stimuli can force particular responses." A stimulus does not exist independently of the child's cognitive activity; instead it is a perceptual experience as interpreted by the child in terms of his or her cognitive structures. Thus, the meaning which two children give to, say, "4 + 3 = " may well be very different -- they respond to different stimuli even if they both immediately say "seven."

The distinction between structuralist and behaviorist curricula refers to differences in the system of explicit and tacit beliefs which guide teachers' practices as they interact with children. Children continually attempt to actively structure and organize their experiences and to explain their worlds are the way they are regardless of what their teachers think they are doing. This is so even if the teacher is a radical behaviorist who does his or her utmost to ensure that children learn isolated fragments of knowledge. In short, the labels "structuralist" and "behaviorist" capture differences in implementation. These are differences in curricula from teachers' perspectives. A classroom observer would be able to determine whether a particular curriculum is structuralist or behaviorist in nature by analyzing only the teacher's activity; he or she would not have to analyze the children's behavior. However, if the observer does focus on the children's rather than the teacher's activity, differences would

undoubtedly be noticed. These would be differences in actual curricula, in the ways the children organize and account for their experiences. Robbins and Doll (1982) report that an observer of the experimental (i.e. structuralist) and control (i.e. behaviorist) groups of their structural arithmetic program came to the following conclusions.

> ... a difference in attitude was apparent, a difference we believe goes well beyond the mathematical abilities of each group ... As the observer said, "The control group will do only that which has been taught. The experimental group will try anything – and with interest." (pp. 9-10)

In my own work with beginning second-graders, I found that some children persist in using the figurative, rote algorithms they had learned in class even though they had alternative powerful concepts and operations available. These children appeared to be far less competent than they actually were. Confrey (1982) came to a smiliar conclusion when she investigated high-school students' knowledge of algebra. In both these cases, it is reasonable to assume that the teachers were behaviorists at heart.

These three sets of observations suggest that the crucial difference in the actual curricula is far deeper than the mathematics knowledge constructed. It involves the children's expectations and anticipations of both what is likely to happen in mathematical contexts and the ways in which they will deal with these events. The children in Robbins' and Doll's experimental group "confidently attempted to solve new problems by utilizing various heuristic methods" precisely because they actively looked for opportunities to use these methods -- they viewed mathematics as an activity in which one attempts to go beyond the routine and formulate novel solutions. Their understanding of their relationship with the teacher (i.e. the social context within which they did mathematics) is such that they try to think things through for themselves. "Children in the control group, however, were reluctant to attempt problems with which they were not familiar" (46). Mathematics, for these children, is an activity in which one uses routine, tried and tested methods. Their social context is such that waiting for or

asking for assistance is the first rather than the last strategy used when their routine methods do not work. In my own work with second-graders, I had to spend a considerable amount of time helping the children differentiate between the context of doing mathematics in class and doing mathematics with me. The children appeared to be far more competent once they had made this distinction. They now interpreted and solved problems by using previously dormant cognitive structures. The children in the control group may also have been more competent than they seemed to be. Perhaps they were using the limited repertoire of methods which was consistent with their world views of mathematics.

Thus far, two consequences of the differences between interactionist and the radical constructivist positions have been discussed. The first concerned the process of canalization while the second involved the difference between structuralist and behaviorist curricula. The third consequence concerns the behavior of teachers whose activities are guided by interactionist and radical constructivist theories. For the interactionist teacher,

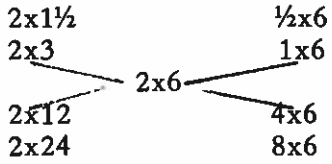
> ... the key is to pay attention to the interaction between the immature, developing structures of the learner and the mature, developed structures of the discipline ... the teacher needs to organize the curriculum so that the student's structures are continually interacting, at the appropriate level, with those of the discipline(s) being studied.

For the interactionist, the structures of the discipline have an ontological extreme. The art of curriculum development involves planning activities so that the child's mind comes into contact and interacts with these structures. Radical constructivists, however, consider that the structures of the discipline as they "see" them are their own construction -- they are things which can be taken as a given relative to more sophisticated cognitive structures. Subscribers to this position regard the structure of the discipline as a projection of the result of their own conceptual activities into their experiential worlds. The structures an individual "sees" depend upon on the individual's knowledge of the discipline (i.e. existing cognitive structures) and on the context

in which he or she is operating. In the case of arithmetic, for example, the leaders of the new mathematics movement, most of whom were mathematicians, "saw" a formal system. For them, arithmetic was structured by an abstract set of properties such as associativity, distributivity, and commutativity. Doll, in contrast, considers that less abstract structures are relevant. Most elementary school teachers "see" little more than an isolated collection of facts and skills.

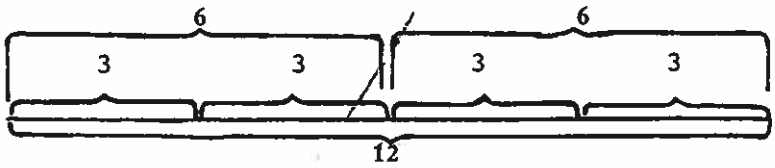
The key for the radical constructivist teacher is to encourage the child to reflect on his or her own activity. The teacher attempts to help the child step back and interact with his or her own activity rather than with the structures of the discipline as the teacher "sees" them. To do this, the teacher first has to analyze the child's activity in a wide variety of situations and infer what that activity might mean to the child. The teacher is aware that he or she will "see" relationships in the child's activity which are not there as givens for the child. The teacher then decides which of these relationships lie just beyond the boundaries of the child's awareness. Finally, activities are planned in the hope that the child will reflect on his or her experiences and make an abstraction. Here, the teacher focuses on structures which he believes are implicit in the child's activity rather than on the structures he reads into the discipline.

Consider an example Doll gives of arithmetic material presented in structural or patterned form.



Here it is hoped that the child will abstract the double-half relationship which, for the interactionist, is in the material. However, for the radical constructivist, the children have to reflect on and reorganize their activity of finding products. In particular, having solved, say 2x3 and 2x6, the child would have to simultaneously decompose 12 into units of 6, and 6

into units of three (technically, the child would have to compose the measurement units three and six). That is, the child would have to "see" the following part-whole relationships in their activity:



This material would be unsuitable for the many second- and third-grade children who are, as yet, unable to compose measurement units. These children might pick-out isolated patterns in sequences of numerals (e.g. 1, 2, 4, 8 or 6, 12, 24, 48) in an effort to behave appropriately. And in doing so in this and other situations, they might construct a world view of mathematics which is at variance with Doll's objectives. It is instructive to note that

> ... it was the top third of each grade which benefited most and enjoyed the [structuralist] program most ... The lower group, about four or five in number, definitely showed signs of being and feeling inferior to the rest. They needed encouragement, prodding, enticement -- not continually, but substantially.

Doll goes on to say that the lower experimental group did better on standarized tests than their control group counterparts. This indicates that the structuralist curriculum was an improvement over the behaviorist curriculum even for these students. However, the ideal is to develop curricula which all children enjoy, where none have to be prodded or enticed. The only solution to this problem would seem to be to focus on and analyze individual children's activity when developing curricula. In the case of children who cannot compose measurement units, the teacher would first try to help the children construct the necessary cognitive structures. This, of course, places even more demands on the teacher as curriculum-developer.

In the concluding section of his essay, Doll discusses five pedagogic principles which, he proposes, should guide teachers' practices. These principles are consistent with the

view that teachers should help children construct knowledge which will allow them "to go beyond the information given" (Bruner, 1973, p. 347). In other words, children should learn how to learn on their own. Robbins and Doll (1982) argue that these general objectives are compatible with the needs of contemporary society. This claim is reasonable if one assumes that the school's sole function is to educate children. However, schools are also social institutions; it is expected that they will inculcate the predominant moral, social, and political values. Stake and Easley (1978) came to the following conclusions when they summarized the findings of ten ethnographic case studies of mathematic classrooms.

> Most teachers seemed to treat subject matter knowledge as evidence of, and subject materials as a means to, the *socialization* of the individual in the school ... a most common and vigorously defended purpose was that of socialization. It was intimately related to observance of the mores of the community, submitting personal inclinations to the needs of the community, conforming to the role of the "good student," and getting ready for the next rung on the educational ladder. (pp. 16-24)
>
> Such socialization in the classroom was preemptive in that it seemed to get attention almost whenever an opportunity arose. Other learnings were interrupted or set aside. (pp. 16-25)

Lortie (1975) also found that teachers' socialization goals took priority over their educational goals. These socialization goals are derived from the belief that consumption of material commodities is alone of intrinsic value and all other human activity is merely instrumental to the satisfaction of this goal.

> Education, as a preparation for this sort of life, is not even remotely concerned with the development of rational autonomy and intellectual freedom. It is only concerned with fitting people with the attitudes and skills necessary to be successful in a society in which this kind of instrumental rationality is endemic. (Carr, 1981, p. 18)

The deterministic view of change is, of course, implicit in

this instrumental rationality. From this perspective, none of the rungs of the educational ladder has instrinsic value; each is means to an end, a credit-note which can later be cashed in.

Doll's desire to help children to become critical, autonomous thinkers clashes with the socially accepted view of the educated person. This, of course, does not alter the fact that Doll's goals are superior to and more rational than the currently dominant positivist socialization goals. However, educators who share his beliefs will have to deal with politicians for whom education is about providing a labor force and raising the Gross National Product and parents for whom it is about acquiring qualifications and status. In short, helping teachers to operate in worlds of teaching and learning which are refracted through a prism of humanistic beliefs might be more difficult than Robbins and Doll imagine.

I hope I have not left the reader with a false impression of my opinion of this paper. I have attempted to play the role of the hyper-critic; I am sure that this is what Bill Doll would want me to do. He is one of those rare individuals who actively encourages and welcomes criticism. Few Piagetians are so at ease with themselves that they can appreciate the full implication of Piaget's slogan *equilibrium -- disequilibrium -- reequilibration* for their own intellectual development. Bill is such a person; he constantly strives to transcend his current state of equilibrium by actively searching for perturbations.

I have questioned Doll's interpretation of only one of the four organismic assumptions and I have taken issue with only one of his five pedagogic principles. My brief comments on the social role of the school were meant to highlight some of the difficulties which must be addressed before Doll's vision can be realized in practice. This in no way detracts from the intrinsic value of his proposals. In fact, I have been somewhat hypercritical; my comments about his second pedagogical principle indicate that I am just as much an idealist (in both the philosophical and non-philosophical senses of the term) as Doll.

This is an essay I will reread on my occasions, each time connecting seemingly unrelated ideas in my own thinking. I hope that he will again share the fruits of his never-ending

intellectual journey in the near future.

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Bergamo.

(See inside back cover for details.)

REDUCTIONISM, INTELLIGENCE, AND THE PROCESS CURRICULUM

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.The issues that William Doll addresses in his essay are important, his approach and conclusions provocative, well worth extended discussion and analysis. I am first going to treat briefly several of the historical and background scientific issues he develops before launching into a more extended analysis of the epistemological and curricular model he presents.

I The contrast that Doll makes between the idealistic and the materialistic (read "realistic") approaches to science and knowledge is valid. The general trend toward a kind of idealistic framework within which to understand scientific theorizing has been widely noted. Among sophisticated scientists this understanding of scientific principle and law as being symbolic has led away from postulating descriptive views of reality on the basis of any one new theoretical breakthrough.

The term "idealistic" is dangerous, for it can conjure up some of the absolute idealism stemming from the nineteenth century Hegelian tradition. More accurately, the idealism Doll describes is a critical idealism, closely resembling the neo-Kantian tradition of late nineteenth, early twentieth century philosophy. From this perspective both Einstein and Piaget gained much. And, in spite of Einstein's stubborn demand that physics not abandon its reach for a full description in the Newtonian sense, of moving bodies, he too did not see his own theories as absolute. He demanded more than could be accommodated through deterministic knowledge from physical experience. Today we well appreciate that the probabilistic form of quantum theory fully fulfills

the quest for causality. The shape and character of the principles are here different. Yet, they are hypothetical, predictive, and have moved all of us away from any static view of the formal shape of our scientific laws and theories.

II Doll is at pains to avoid reductionism. This is both good and bad. Good in the sense that reductions usually are enunciated in philosophical terms at early stages in our knowledge, as, for example, the relationship between biological and chemical phenomena, or biological and social structures. Usually such attempts to root more complex relationships in simpler as well as more solid phenomena, e.g., chemistry or physics, result in dogmatisms or simplistic analogies.

Doll pushes this weakness in the bio-physical tango a bit far, almost to deny that causal entailments could develop between physical principles and biological phenomena. Beware of this denial, because biological phenomena *are* subject to the laws of physics. They are composed of molecules, atoms, energetic interactions, gravitational movements, etc. And, if we as yet have not subjected the behavior of biological bodies to the larger physico-chemical design of things, the cause is our state of knowledge, not a metaphysically impermeable membrane of principle.

To so deny the possible interconvertibility of biological and physical processes is to dangle on the edge of mysticism. I am sure that Doll does not want to head in that direction, but he does edge toward it in his serious and approving discussion of Waddington's work.

III My sense is that Doll puts forth Waddington's inner determination based on environmental/individual interaction because of his epistemological fear of Darwinism-Mendelism and its seemingly externalistic (mechanistic) and materialistic (realistic) character. The suspicion here is that the working out of selective forces acting on random mutations insulated against the environment and the subjects' will would act to neutralize all hope of inner determination and free will in the subject. Hence, the postulation of Waddington's modified Lamarckianism.

Shades of Piaget and the entire synthetic theories of evolution! These jumps and assumptions into the human

educational dilemma are all too premature. What genetic and evolutionary theories have to say about human cognition, educational curricula, and the mathematics learnings of second and third graders are yet heavily obscured.

Both selectionist evolutionary biology and modern genetic theory have been developing ever more powerful theoretical models of great predictive power. Waddington is a great biologist. He has merely jumped too quickly into philosophical speculation because of what he fears this science may say for free will and the human soul. I believe his work is the product of much wishful thinking. He has embarked on a precarious scientific expedition to sweep away the empirical evidence for his philosophical and religious concerns. Doll ought not build a bio-psycholgical platform for his curricular evidence on such a shaky base.

Even today the hard granular genes that have formed the bedrock of a materialistic and probabilistic source of our evolutionary panorama have given way to a swirl of complex protein molecules, amino acids, helixes, etc. Even if beyond the biochemistry a lurking physicalism may be discerned, still there is no cause for educational alarm. The theories are models, even the Darwinian trinity of mutation, adaptation, and natural selection. That they predict events is good for now. Eventually, as with all symbolic constructs, they will evolve into new formulations.

IV Doll has Piaget arrive finally on the scene, a philosophical biologist, securely insulated from the materialistic, empiricist, tabula rasa approach. That Piaget's inner developmental approach (genetic epistemology) to the gaining of knowledge has some vague similarity to Waddington's approach ought not be seen as crucial. There are miles of philosophical and historical background differences between the two. That Piaget was deeply influenced by Boutroux and Meyerson indicates a strong neo-Kantian bias that always eschewed contact with the "real" whether in external material things or in internal, supernatural, ideational elements.

I suspect that a close reading of Piaget would reveal that the evolving mind of the human being, which appears so autonomous and resilient in its interaction with the external

world of today only *seems* to be autonomous. Rather, the working out of its inner logic, self-maintenance in the face of seemingly intransigent external forces or blockages, merely represents, in structure and behavior, the solidification by natural selection of the random biochemical changes that have taken place over a billion years of shapings and moldings. This is time enough for any creature to show a measure of resilience as against day to day environmental manipulation and seemingly to reveal an innerness and autonomy over events. An autonomy given the events of today may be supported, but not over the accumulated events, alterations, solidifications of many billions of changes of our past.

Thus we can easily equate the facts of human evolution that have resulted in such entities and behaviors we call thinking, feeling, believing, creating culture, morality, futurity, with the natural processes pictured in the Darwinian synthesis. What Jean Piaget has to say about the manner in which human thought is precipitated by encounters with intransigent factors, struggling to achieve stasis or equilibration within a forever changing world, is perfectly consonant with modern and orthodox Darwinianism. One need not reify another naturalistic or even materialistic process for this accommodating human mentation, despite the quite radical new turn that nature has given to human intelligence, as compared with even our contemporary anthropoid brethren.

Doll argues persuasively for the Piagetian view of thinking as constituting a central model for curriculum building. This educational task he rightly sees as deriving its powerful epistemological *raison d'etre* from the sweep of biological truths that are embodied in the way we think. Notice that Doll, also rightly does not fear to be accused of a kind of biological reductivism in seeing the sources for what purprotedly is a social and cultural enterprise (education, curriculum).

I would have found it interesting to hear in more detail a philosophical justification for the support he finds in biology for educational practice. But I agree it is not reductionist.

It is curious, then, to read his *pro forma* and dutiful

slap at the psychometricians with their I.Q. tests and the accusations of reification directed against Spearman. Doll accuses Spearman of reifying I.Q. into a permanent substantiality. Naturally this contrasts with Piaget's process orientation, far more in tune with an evolving organismic view of biosocial experience. But is this accusation fair and what does it imply for the model? After all, the I.Q. people do argue that their model of intelligence is: 1) biological, 2) scientific-hypothetical, and 3) predictive.

If on the one hand we can agree with Doll in his placing of Waddington in opposition to orthodox selectionist and Mendelian biology, could he here also be contrasting Piagetian genetic epistemology to contemporary psychometrics as a key to understanding learning? In the first case, Doll is surely the loser, for Waddington's views border on that ancient and discredited theory, orthogenesis. It won few adherents and will likely be buried with its espousers.

But what about Piaget and the tradition of Spearman? Is there here an important opposition, significant in its bearing on Doll's general intellectual outlook? Or was this a passing slap at the *bete noir* of a certain prominent ideological wing of academe? I see the constrast, not the opposition, with Piaget of psychometrics and its genetic view of intelligence to be extremely enlightening and capable of illuminating Doll's interesting thesis in a heretofore unexpected manner.

There is room for argument as to whether Spearman himself saw "g" as a substantial reality. Clearly today the I.Q. has a largely operational meaning. "G" can be seen as a locus of correlations that seems to involve certain similar mental operations over a large number of tests. Tests heavily loaded for "g" mesh with other tests that have significant relational, operational demands on thought. They require insights and active processing procedures that pure memory or stored facts do not bring forth.

As a matter of fact, the "g" factor that is extracted from a wide variety of testing situations and materials comes very close to revealing the same mental operations that Piaget puts forth for "formal" thought and the logico-deductive method. Naturally the purely symbolic meaning of "g" does call forth a further scientific or philosophical question.

For those individuals whose scores on a variety of tests seems to reveal a coherent "g," does this factor point to a real substantiality -- intelligence/brain?

One can deride and condemn I.Q. testing. Unfortunately -- or not -- the predictability of I.Q. for a given, if limited, domain of academic and/or intellectual behavior has been universally persuasive. So much so that even Stephen Gould, himself not immune from the lure of ideological preaching, has admitted the heuristic utility of I.Q. testing, but naturally condemned its misuses. In every area of our social life, testing spreads, often like a plague. I can't help believing that those sponsoring the tests must receive some feedback of knowledge that they can't otherwise obtain, that serves their interests.

Let me summarize what I am arguing in this section by saying that I believe that William Doll is exactly right in looking beyond Piaget's model of knowledge going on to his broader biological perspectives from which one can find a rich spectrum of possibilities for learning, curriculum building, and education in general. I will certainly agree that the behavioristic position that Doll rejects was reductive in the rat psychology sense and that those progressive educators, Dewey excluded, who based their pedagogy on it came a cropper. But it is important to note why that particular form of behaviorism failed. As Doll notes, it neglected the inner/outer qualities of learning and became rigidly committed to a tabula rasa, stimulus-response model. This indeed was a caricature of learning, of the humans that did the learning, and led eventually to cold, mechanical teaching and curricular approaches.

If progressive education failed, so has much of that kind of education that Bill Doll espouses. Note that his own experiment involves second and third graders in a math program that reminds one uncommonly of the old "new math." Remember those curricula stimulated by the Sputniks and the cold war? We also had the new biology in three versions; *Man, a course of study,* a new social studies stimulated by Jerome Bruner, etc.

As Morris Kline has noted, the new math has faded, and perhaps for real and good reasons. All the great innovations

have disappeared, some watered down, but all are considered disasters in that they were far beyond the average educational abilities of the masses. What Doll proposes had better be placed on the desks of junior and senior high school students. That is where the failure begins, witness our culture, our technology, our economy, even our war-making abilities.

Doll has latched onto the right man -- Piaget -- but for the wrong intellectual and ultimately wrong educational reasons. In the final section, I will elaborate on this and propose at least a direction that might ensure a greater measure of success to Doll's fine educational aims.

V There is an unfortunate, at least implicit, lumping of psychometrics with behaviorism as mechanstic, absolutistic, and externalist perspectives on human behavior. I want briefly to indicate that this is not true in the perspective on human intelligence that seems to be revealed in psychometric analysis.

It is true that in behaviorism, what you are is a product of the inputs that have been placed to elicit rigidly programmed adaptive behavior, your responses, the human correlates of instinct in the animal. That human beings are determined by their drives as elicited by external stimuli is affirmed in behavioristic theory.

The "g" of intelligence testing is quite a different product than behaviorism's picture of human intelligence. One can see this intelligence as a hierarchy of primary abilities, as with Thurston, or as a wide variety of affiliated competencies, as with Guilford. Certainly the autonomous search for meaning, the inner acting on external factors, the indeterminate direction of creative inquiry all argue for a picture of the human mind far more consonant with Piaget than with Skinner.

This similiarity is far clearer than Doll would indicate. And it is in this similarity that one understands the educational failure of that problem solving, structured curriculum that I alluded to above and which is at the center of Doll's educational quest.

This similarity can be best explained by phrasing the product of these respective biosocial perspectives as being educationally realized in a variety of *curricula*. There is thus

not one curriculum for all children, but a variety of curricula with their several intellectual and logical goals, depending on the child. Yes, here is that mysterious individuality that doubled over the old progressives in ecstasy. The psychometricians merely point to the dolorous but apparent variability in intellectual productivity among human beings, and not necessarily as the mythology holds, as caused by external social factors.

Throughout the Piagetian literature, as far back as Elkind's early elucidation of Piaget's ideas, we see an attempt to account for variability of achievement of youngsters through the stages of intellectual development. Even breaking the logico-deductive border is not enough. For, like the oinon the levels of mastery of principle are manifold and not all individuals can peel and penetrate beyond to the depths.

This is not to say that the Piagetians are willing to give their psycho-biological formulations a numerical equivalence, though Piaget knows how tempting is this Platonic-Pythagorean ideal. Yet I think if one reads the recent literature, the awareness of intellectual differences becomes tangible. They cannot be avoided, for in this case art has given subtle but powerful confirmation to intellectual reality. We can no longer play the game of hope that the early progressive educationists played with their dream of a nation, indeed a world, of secular problem solvers. This is not to say that the calling of a teacher or educator should under any conditions exclude the most strenuous efforts to help stimulate children to surpass the social impediments of birth and class. But even the most devoted and effusive efforts to stimulate educational and intellectual advance are often doomed to frustration and failure.

This will be more so the case if the curricular designs do not match the individual potentialities and talents of the children. This is where my positive proposal intrudes. For it is the lamented failure of the great curriculum designs of the late 50's and 60's that forced reality upon us.

A curriculum designed to stimulate an average intelligence to perfect even a reproductive and rote mentality will leave that individual with real if modest skills, but also

a sense of success, not frustration and failure. While such skills are rapidly fading from our pantheon of historical needs, there will always be jobs requiring even modest intelligence.

I would therefore propose that this biological intelligence that wells up from each of our unique personalities, which determines our sense of wholeness, ought to be served by a far more flexible educational menu than has usually been set forth by either theoreticians or practitioners. I would urge Doll and his cohorts to plan a variety of curricular meals structured on the basis of intellectual, thus logical, diversity.

Can this be achieved given our rather monolithic and bureaucratic educational establishment? Probably not. It would be quite expensive and would require much flexibility. Better to water it all down to a more mediocre common denominator, as happened in the 70's? Then we lose our best talents and our society goes to pot. But what then can you expect of this army?

* * *

Bergamo.

WHY IS PIAGET SO HARD TO APPLY IN THE CLASSROOM?

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In "Curriculum and Change: Piaget's Organismic Origins," William Doll has analyzed "four separate but interrelated points." While it is tempting to say something about each of them, it may be more profitable to examine one of them in some depth. His last point was "to examine and outline some of the curricular and instructional implications of a structuralist view," and it is this point on which I shall concentrate. My remarks will be organized under three topical headings: Cognitive Structures, Equilibration and Dynamic Factors, and Difficulties with Assimilation/Accommodation. I should say at the outset that most of the problems to be discussed here are located in Piaget's theories themselves and not in Doll's interpretations of them.

Cognitive Structures

In a recent paper, D. C. Phillips (1982) summarized a number of the liveliest disputes over "cognitive structures." Among the thorniest and most interesting problems, one of considerable concern to Phillips, is how we can infer from performance what sort of "cognitive structure" has been activated. Related to this are questions about the claimed universality of certain basic structures and the usefulness of these structures (if they exist at all) for pedagogical purposes. These are obviously important questions. They boil down to a skeptical demand for answers to fundamental questions: What *are* cognitive structures? (What is their form? their content?) How can we identify them in individual sub-

jects? What can we, as teachers, do about them once they are identified?

Doll quotes me, correctly, as having said that the purpose of curriculum and instruction must be "the transformation of cognitive structure and not just mastery of a task" (Doll, p. 41; Noddings, 1974, p. 360). What I had in mind at that time was a view of cognitive structure that includes the following: 1) a thorough description of the context of performance from which inferences are to be made; 2) a description of the heuristics employed; 3) a description of the routines involved; 4) a structural picture of "cognitive structures" constructed from the first three components. This process involves making inferences, of course, but over a much narrower range and to a lower level of abstraction than Piaget's general intellectual structures. I still think it is likely that, in a given situation involving a well-defined task, a finite number of effective and ineffective cognitive structures may be identified and described. But I have doubts about both the unversality and usefulness of structures described at a level of abstraction that neglects both the nature of *elements* in the structure and the nature of the *performance situation*. This is not to say that I would discard notions of *competence*; rather, it is to say that I would define the structures of competence much more narrowly and specifically. Further, I would not suggest that certain dynamic factors and beliefs be included in the description of cognitive structure, and I'll argue for such inclusion a bit later.

Professor Doll seems to accept Piaget's claims for the universality of intellectual structures and their tendency to develop toward the logical. He says: "Further, structures have a teleonomic tendency to develop towards the logico-mathematical; thus, there is a sense of universality about structures." (p. 44). Now, this is just what I am inclined to deny. There may be some structures that develop in all of us -- in, that is, an "epistemological subject" -- but such structures, if they exist, are relatively useless for pedagogy. At most, they might be used to make decisions about when to teach certain things, but their usefulness would be restricted to childhood education. Of what positive use is

the description of a stage of formal operations? If we accept it, we would refrain from teaching prematurely those things that require such operations, but we receive no guidance on how teach students who are already in that stage. The differences in how people, all supposedly at the stage of formal operations, approach intellectual problems are obviously great. If the notion of cognitive structures is to be useful for curriculum and instruction, it has to be elaborated in a way that captures these differences and helps in assessing the relative strengths and weaknesses of the structures identified.

Now, in fairness, Piaget said a great deal about how cognitive structures *are formed*, and his descriptions should be relevant to the structures with which educators are concerned. But he said almost nothing about how we should *describe* these structures. On this point, we have only a highly abstract, mathematical description of general intellectual operations. When we try to make educational applications of this description, we fall into an error analogous to that made by many proponents of the "new math": we suppose that *form* can be accurately descriptive without content. Let me illustrate the kind of error I'm talking about. In trying to approach mathematics through fundamental principles and structures, we emphasized such properties as the commutative, associative, and distributive laws. We wanted students to understand *commutativity, associativity,* etc. But very few people achieve such an understanding, and it may be that the level of understanding will always and inevitably be tied to the actual elements under manipulation. Consider this problem:

> Suppose we define an operation * on the set of integers as follows: $x * y = x + 2y$. ($b * a = b + 2a$; $z * x = z + 2x$, etc.) Is * commutative?

Now, it has been my experience that the vast majority of students (college or senior high school) cannot handle such a problem. Most do not know where to begin. All of these students know that $2 + 5 = 5 + 2$, that one-fourth times three-sevenths equals three-sevenths times one-fourth, and even that $(a + b)(a - b) = (a - b)(b + a)$ if "a" and "b" are real numbers. But that does not mean that they "understand commutativity." Faced with the problem above,

typical responses are: 1) "Yes, because addition is commutative." (Here the student supposes that because $x + 2y = 2y + x$, $x * y = y * x$.) 2) "What is '*'? Is it addition?" 3) "What are 'x' and 'y'?" A very few students realize that they must show that $x * y = y * x$ in order to establish the commutativity of *, and not all of these can go on to show that * is not, in this case, commutative.

There are two points to be made in light of this example. One is, of course, that we should be very careful about the language we use if we want to be sure to convey meaning reliably. When we talk about teaching students to measure, to classify, to conserve and the like, we should add *objects* to our verbs; students learn to measure, e.g., length of line segments in certain units, to classify sea shells of a limited kind, to conserve volume of liquids. Similarly, when they learn something about the property of commutativity, they learn that addition of natural numbers is commutative, etc. When we consider extending a skill, property, or principle to another level, we always have to ask what role is played by familiarity with the objects under study. The notion that "learning the fundamental principles" leads rapidly to transfer and hence to the frontiers of knowledge is an optimistic notion but one that is, so far, with little foundation. Even at sophisticated levels of mathematical work, a great deal of playing with concrete objects (very sophisticated concrete objects that would seem highly abstract to most of us) is required. The willingness to engage in the selection or construction of such objects, the skill in manipulating and observing their behavior, the realization that all this *is* "mathematical behavior" -- all these things are part of the cognitive structure of mathematicians. So my second point is that we need to describe activities typical of various disciplines not only in terms of the *results* that are obtained and organized through them but in terms of the activities themselves: the questions that give rise to certain moves, the standard nature of certain strategies, the ways in which to conduct orderly investigation.

Clearly, this emphasis on construction, manipulation, and observation is not anti-Piagetian. On the contrary, it is in line with Piaget's lengthy descriptions of how cognitive

structures are formed. But it leads us to consider the formation of structures that are *not* typical of the "logico-mathematical" in the normative sense. These structures resemble the logico-mathematical in their systematic functioning, but they are either limited in what they can produce or they actually produce wrong answers. Why should we suppose that purposeful activity, repeatedly engaged, must necessarily be internalized in structures that are actual structures of mathematics?

What I am suggesting is that a useful view of cognitive structure must include psychological components that differentiate it from logical structure. A *cognitive* structure is not just an accurate replica of logical structure. It is not even a mere faulty version of some logical structure. It is that which reveals the *genesis* of logical structures in human mental activity. If we present ten concepts to our students and ask them to organize these concepts into some sort of structural picture, perhaps a tree, we cannot suppose that the resulting structure is an accurate reflection of cognitive structure. (See Phillips, *op. cit.*) If we withhold the concepts and, instead, present a situation that would call forth these concepts from experts, the concepts might not appear at all, or some of them might appear in odd concatenation with others we have not even considered. It seems reasonable to insist that descriptions of *cognitive* structure should reveal the genesis of both logical and faulty organizations of subject matter. Surely not every chain of "developing" cognitive structures tends toward the logico-mathematical.

One reason, then, that Piaget is hard to apply in the classroom is that we have not developed a sound and useful method by which to describe the cognitive structures of learners. This methodological gap is revealed in Doll's description of his own work. He describes the intentions of the structural approach as follows:

> 1) We would pay attention to children's structures;
> 2) we would present arithmetic material in a structural or patterned form, and in a manner which allowed children to operate or act in an assimilative - accommodative way;
> 3) we would encourage the children to construct –

alternatives, extensions, patterns. (p. 45)

What does paying "attention to children's structures" involve? We are told quite a lot about the *presentational* structures of the curriculum but almost nothing about the diagnosis of "children's structures." It is entirely possible that the patterned activities are themselves important simply as prototypes of mathematical activity and not because they induce changes in "cognitive structure." Now, as a matter of honesty, I suspect they *do* induce such transformations, but I do not see how we can prove such a hypothesis without a sound definition of cognitive structures. Before continuing the discussion of what it is in "cognitive structures" that makes Piaget hard to apply, I should mention that statement (2) above involves another important problem that I shall return to: what does it mean to "act in an assimilative - accommodative way"? Does it make sense to talk this way about cognitive structures whose content is mathematical?

Besides the lack of an unequivocal definition of "cognitive structure," there is something else that makes the concept difficult to apply: the notion that one really does not have to do much about faulty structures except to identify them and bring them to the consciousness of their owners. Doll, for example, says:

> It is not necessary or even productive for the teacher to worry excessively about mistakes, for once the individual knows a mistake exists there is a natural predilection for the individual to correct it (for the regulatory mechanisms to work). (p. 48)

This seems to be an accurate interpretation of Piaget, but Piaget may be dead wrong in this. Indeed, many years of teaching mathematics suggest to me that he *is* wrong in this. Strictly speaking, what Piaget suggests is that "re-quilibration" will be triggered and on this we might agree, but the complete body of his work suggests (and Doll's use of "correct it" reinforces this) that re-equilibration will result in something "better" – something tending toward the mathematically acceptable. I think there is reason to doubt this and, in the next section, I shall point to some evidence that supports this doubt.

When we do encounter instances susceptible to Piaget's

description of re-equilibration in mathematical activity, we are hard put to find a role for pedagogy. Consider this example: Danny, age seven, still uses the "sum model" for addition. To add 7 and 5, he manually or visually picks out 7 objects and then 5 objects, puts them together, and counts from 1 to 12 to produce the answer. [A case like this is described in a recent dissertation by Susan Shipstead (1982).] Most of his second-grade classmates use the "min model": they start with 7 and add on 5, saying, "eight, nine, ... twelve." It is highly unlikely that Danny will adopt the "min model" simply because we show him the limitations and frustrations involved in using the "sum model." In fact, most of our evidence suggests that he will not. Now is this because the "sum model" represents a stage-specific form of intellectual functioning and is, therefore, resistant to anything that may hasten it? Is it simply impossible to introduce any *dis*-equilibrium in such a case?

I think we need to study questions of this sort openly and deeply. Too often we leave our analyses in a destructive state when what we badly need is a constructive effort. What kinds of tasks fall under the constraints of stage specific functions? What sort may yield to clever interventions? Claims that we can teach anything to anyone ... and claims that we cannot teach some things at certain stages (regardless of preparation) both invite challenge. What might we do, for example, with Danny? Some teachers have tried this with success: just as the youngster begins to push the two sets together, hold his hand over the first set of objects and ask him how many are there. Then direct him to pretend he's counted that far and go on. Will this always work? I certainly do not know. Is it important that we use the child's *own hand* to cover the objects? Again, I do not know, but those of us who find something that rings true in the writings of Piaget are likely to think so. The child's own action is instrumental; if *we* make the decision to act, as in this case, we may still try to preserve the child's own *touch*.

The case we have just considered is an important one because it represents a *bona fide* case of potential equilibration in Piaget's description of mathematical structures.

The original structure *is* a mathematical structure; it is not a faulty cognitive representation of mathematical objects. But it is limited and clumsy; it needs extension to more efficient and encompassing structures. Even in such situations, simply exposing the limitation of the method is not sufficient for equilibration in the direction of "better structures."

A more important practical question is whether simply exposing an error or faulty structure (as opposed to a proper but limited one) is sufficient to trigger movement in a "better" direction. The idea has been with us at least since Spinoza, and it was certainly echoed in the work of Freud. Interestingly, these were deterministic systems and the only possibility for change within them was realization of the cause of error and active concentration on some available, more adequate scheme. [This underscores the credibility of Sophie Haroutunian's complaint about Piaget's treatment of equilibration in open systems. (1980).] But such thinking is still with us and not only in Piaget. We see it today in the work of researchers interested in diagnosis. The *Buggy* program of Brown and Burton (1978), for example, is designed to help teachers learn to diagnose faulty algorithms in arithmetic. The assumption is that faulty structures as well as appropriate ones exist and if we can identify faulty structures, we have a chance to eliminate *systematic error.* Clearly, this is very like inducing a transformation of cognitive structure. But Brown and Burton have so far not addressed questions of remediation; it is not clear whether they think, along with Piaget, that if we once see that something is wrong, we will correct it, and so all the teacher needs to do is bring the faulty algorithm to the attention of the student using it.

I want to raise further questions about equilibration but, before pursuing them, I want to make clear what I am trying to by proceeding in this fashion, using concrete questions and suggestions. I feel, in agreement with Professor Doll, that there may be much of practical use in Piaget's work. But I think that we need to examine his claims and particularly the terms in which they are cast very carefully to find out just how they might be applied in practice. We must

continue to ask: what does this mean? Does this agree with our concrete experience?

In concluding this section, I'd like to suggest a concrete but tentative definition of cognitive structure. A *mathematical* structure is usually described in terms of a set of elements together with one or more operations and a set of rules describing the behavior of elements under these operations. In shorthand, we describe a structure "S" as: "S" = (S,⊕) where S is a set of elements and ⊕ is an operaton on S governed by precisely stated rules. This is the way in which Piaget also describes cognitive structures, and I have agreed with D. C. Phillips and others that this approach is almost certainly in error. Alternatively, we might define a cognitive structure as a system = (C, P, S; ⊕, ⊙, . . .) in which C represents contextual elements; P represents psychological (particularly dynamic or motivational) elements; S represents the objective elements as identified, labeled, and manipulated by the subject; and ⊕, and ⊙, etc. are operations applied to S. The application of these operations would, of course, be described by a set of rules or transformations but these would include *heuristic* rules as well as the sort which, mathematically, guarantee an objectively satisfactory result. It is entirely possible in such a system to have an operation or algorithm that is "buggy" -- that is, one that will *not* consistently produce correct answers. It is also possible that a perfectly good algorithm will be heuristically employed unproductively -- in a situation to which it does not apply. It is clear, further, that the elements represented by C, P, and S might themselves be systems, so the picture is very complex.

Now, of course, from some philosophical positions, it is unacceptable to include either contextual or psychological elements in the conceptualization of *cognitive* structure. Contextual elements are, it is contended, "out there," while cognitive structures are internal; similarly, the sort of psychological elements I have suggested would be labeled "affective," and these must be separated from the "cognitive." But, interestingly, there should be no such objections raised in a Piagetian interactionist framework. Context is not wholly external from such a viewpoint, nor is cognitive

structure totally internal for they are joined in the indissociable bond that defines both subject and object. Hence, I would argue strongly for a definition of cognitive structure that builds solidly and thoroughly on an interactionist (or, better, transactionist) foundation.

If one considers the complex system suggested, it is obvious that much of our work must involve context-dependent transformations. What a learner does in one situation may be different from what the same learner does in another situation. How different? What kinds of heuristics are regularly employed by particular learners? What sorts of systems are facilitative in the sense that they *do* seem to be precursors of true mathematical structures? What sorts (if any) are anti-developmental in the sense that they contain self-conserving rules that resist change? We could go on generating important questions, but this may be enough to suggest the substantial revisions that are required in Piaget's description of cognitive structure.

Equilibration and Dynamic Factors

Here we face two problems foreshadowed earlier. The first is theoretical and the second practical: 1) what reasons have we for supposing that successive equilibrations tend toward logico-mathematical (or "better") structures? 2) What can we as teachers do to induce better structures through equilibration?

Piaget anchored his theoretical argument in what seems to be an elaborately sustained organismic metaphor. Indeed, he carried this metaphor so far and so effectively that he was able to write persuasively of "cognitive organs." But, of course, we cannot isolate or dissect such "organs" physically, and we must be cautious in stretching a metaphor to provide a theoretical ground. Even if equilibration and autoregulation are well established in biology, we still must ask whether they are facts of cognitive life. Another very important question to ask is whether equilibration can be applied as Piaget suggests to all cognitive structures whose content is mathematical or whether it only makes sense to speak of equilibration with respect to actual mathematical

structures. Speaking of accommodation in the production of new cognitive structure, Piaget says:

> There is, however, an exception, and it is the one which has been most difficult to integrate into the usual biological systems: the major exception of logico-mathematical structures, extremely important in itself, and all the more so because such structures produce the chief assimilatory schemata utilized in experimental knowledge. Logico-mathematical structures ... (develop) ... without a break in such a way that no new structuration brings about the elimination of those preceding it; ... (1971, p. 355)

Further,

> ... logico-mathematical structures involve a sui generis equilibrium situation with regard to the relationship between assimilation and accommodation. On one hand, they appear to be a continuous construction of new assimilation schemata: ... on the other hand, logico-mathematical structures give evidence of a permanent accommodation, ... (1971, p. 355)

This account makes it difficult to make any sense of of individual activities that might be called equilibration. An actual *mathematical* structure does, indeed, have the properties described by Piaget. It is not subject to "revolutions" but only to evolutions -- successive embeddings and extensions. But an individual's cognitive structure with respect to mathematics may *not* be a mathematical structure. Can we then describe what happens through successive changes in terms of "equilibration"? Can we depend on successive "re-equilibrations" to bring about changes for the better? What is the nature of cognitive equilibration? What happens when we are confronted with an anomaly, with something that gives rise to dissonance? The first thing we must ask is this: what *causes* dissonance? Do we all react with a sense that "something is the matter" to the same kinds of presentational anomalies, or do some of us placidly shrug off what bothers others intensely? The answer to this seems, obviously, to be that there is wide variation in what disturbs the cognitive balance of individuals. If the development of intellectual structures is the result of equilibration and if

some of these intellectual structures are universal, it must be the case that at least some forms of dissonance arise universally or very nearly so. It is in this matter that Piaget has been accused of neglecting the social factors that press certain forms of dissonance upon us and that, also, continue to press us until we arrive at a "better" structure.

Now if, in fact, it is primarily social factors that determine whether we experience dissonance and under what sort of responses we can be relieved of it, then we really need to study carefully the conditions which give rise to responses by which persons attempt to dispel it. Is it possible that equilibrium can be achieved through a set of errors? It certainly *seems* possible. John Dewey, for example, saw the possibility clearly and insisted on distinguishing between that which is "satisfying," what gives us subjective equilibrium, and that which is *"satisfactory,"* what satisfies the problematic situation and brings equilibrium to *it*.

Clearly, if equilibration can result in faulty structures as well as logically acceptable ones, teachers must be *very* concerned with mistakes and must stand ready continually to arouse in the student the sense that "something is the matter" so long as something *is*, objectively, the matter. Without this constant nagging from objective authority, the student is very likely to achieve peace of mind willy-nilly. We already have some impressive evidence that this happens, and we are likely to accumulate much more as investigations involving protocol analysis continue.

Consider the case of "Benny" reported by S. H. Erlwanger (1973). Benny was quite able to reconcile dramatically different answers by using a set of faulty heuristics. For him, .5, 3/2 and 2/3 were all equivalent! Since the numerators and denominators added to 5, the conversion of either 3/2 or 2/3 to .5 was accomplished in a way that satisfied Benny. He used a basically sound mathematical insight -- namely, that there is often more than one form of a correct answer -- to justify answers that should have caused immediate consternation. Since the answer key exhibited only one form, Benny continued to believe that his wrong answers were really right and needed only conversion to the selected answer form. The entire account of Benny's mis-

conceptions is too lengthy to consider in detail here, but these features of it are important for the present discussion: 1) his wrong answers were *systematically* generated; 2) he expressed a fundamental belief that enabled him to resolve discrepancies; and 3) the "re-equilibrations" he made under his fundamental belief were tending toward the formation of structures that were unmathematical. With respect to this last feature, the development of faulty structures, we might predict that poor Benny will be forever lost in the world of mathematics.

The first lesson that I would extract from our encounter with Benny is two-fold: first, what is learned does seem to be internalized in structures; second, the structure formed need not tend toward the logico-mathematical. A question arises immediately concerning what we mean by "structure" when we refer to something that is not and cannot be called "logico-mathematical." Well, Benny's methods *are* structurally generated: there is a set of elements, a set of operations, and a set of rules that govern the behavior of the elements under the given operations. But his system is not logically connected to the fundamental concepts of number. If the elements of his structures are considered to be *numbers*, then his rules are demonstrably wrong. If his rules are considered to be legitimate, then the symbols upon which he operates are not numbers. This underscores again the need to describe the content of structures.

The fact that his errors are systematically generated makes our task as teachers extremely difficult. If Piaget was right in his description of how such structures are formed, it will not be an easy task to transform Benny's structures. Benny has gone at the tasks presented to him *purposefully;* he has experimented and assessed results. Every time he is confronted with dissonance, he finds a way to subsume the inconsistency under his fundamental rule: his own answer is a variation of the *listed* correct one. Our pedagogical task is to convince him that not all rule-generated answers are equivalent to a given, sanctioned one. This involves, I think, a thorough re-education with respect to the elements of the structure; Benny needs to know something about *rational numbers as numbers.* If, for example, he were taught to

count by 1/3's: 1/3, 2/3, 3/3, 4/3, ... , and to match the numbers thus attained with those recorded on a whole number scale and on a half-interval scale, he would surely see that 3/2 does not equal 2/3 does not equal .5. What can a child be thinking when he supposes that 3/2 = 2/3? Surely, his mind has been entiredly focused on rules of manipulation at the neglect of any consideration whatsoever of the *things* being manipulated. His rules work very nicely on objects that exist only temporarily and have no mathematical meaning.

I have been using Benny's case to illustrate what I take to be errors in Piaget's account but, pedagogically, we might use the same case to argue more strongly *for* a Piagetian approach. Benny received his mathematical education in IPI (Individually Prescribed Instruction), and the dissonance he encountered was always the same; it involved whatever appeared on the answer key. Hence Benny had only to construct some rule that would allow him to convert his answer into the sanctioned one. The major fault, then, seems to lie in the system by which Benny was taught.

I think part of the problem does lie in the peculiarly flat, non-communicative nature of IPI. But we, as adherents of Piaget's basic doctrines, must acknowledge that there is nothing in Piaget's theoretical pronouncements to block the results we have just observed. Dissonance and re-equilibration should produce a "better" structure. Clearly nothing of the sort is happening, and Benny's high-school teachers will throw up their hands. It is not just dissonance and re-equilibration that are needed, but the right sort of dissonance and the right sort of re-equilibration, and the initial structure needs to be a *mathematical* one if we are to speak sensibly of equilibration without accommodation. Benny needs to be convinced that what he is doing does not work and to accomplish this, he needs to know how the objects under study are supposed to behave. How would I know that a burned-out light bulb was faulty if I did not know that it was supposed to give light?

It seems to me that the great strength of Piaget's description of cognitive structure lies in his emphasis on reflective abstraction, in the connections among purpose,

action, reflection, and internalization. But here I would turn as happily and confidently to Dewey as to Piaget. I would not have so tidy an account of mathematical necessity, one must admit, but I would have a far clearer account of what I as a teacher must do. Under such direction, I would not interfere with the child's legitimate purpose nor his testing of hypothesized means and ends, but I would continually raise questions about his choices: suppose we tried that on objects of this sort? Suppose we left out step X? What if outcome Y had occurred? Would method Z work as well?

It is in this process -- what Martin Buber refers to as "the questioning glance, the raised finger" -- that the teacher's artistry is displayed. It is not surprising that Professor Doll's structural methods worked best with the brightest students. They, of course, interpreted dissonance in mathematical terms. That is why they are "brightest." The other students did *something* with the dissonance they experienced. What did they do and how will their re-equilibrations serve them in the future?

I suspect, because I have seen Professor Doll's structural curriculum in operation, that pedagogical artistry is very much at the heart of its success. In particular, the great strength of his curriculum is that -- through sound presentational structures and their gradual extension -- children are likely at every stage to develop true, even when limited, mathematical structures. They are not likely to suffer the fate of Benny because Benny-like structures are blocked by the nature of the interactions the curriculum presents. We should conduct a thorough investigation of what goes on in such projects. Here we have a teacher's act, a student's response (or vice-versa); a set of materials, characterized thus and manipulated so, with such-and-such effects. Describe it all meticulously and concretely. Then we might move cautiously and *tentatively* up the ladder of abstraction. How might we describe this activity just a bit more generally? How might we extend the set of objects? How might we expand the repertoire of actions? Armed with this new description as hypothesis, we must then return to the field of concrete activity. What happens now? Has the range

of unfelicitous possibilities expanded?

What we are discussing here is a matter of greatest importance socially and ethically, as well as epistemologically and psychologically. What creates dissonance? How is it that people – technologically literate, religiously educated people – can kill whole populations to achieve "peace"? How is it that parents – conscientious, loving parents – slap their children smartly to "teach" them not to hit others? How is it that obviously intelligent children can decide that 3/2 = 2/3 = .5?

I do not think that we shall be able to sustain the notion that structures tend naturally toward the logico-mathematical. Only logico-mathematical structures do so. Much more attention must be directed toward dynamic factors, toward what people *want* and what they are willing to do to achieve their wants. If peace means that all enemies are dead, then killing is an effective way to achieve it; if not hitting means not doing it in our judgmental presence, then hitting the hitters is a good way to achieve this. And if getting .5 is the goal of mathematical activity and I have a way of making 3/2 into .5, then whatever rule I concoct is a right handy one.

Difficulties with Assimilation/Accommodation

We must now face the conclusion that, since equilibration is not all that much help in describing the development of mathematical cognitive structures in individuals, we must depend on adaptation.

Assimilation and accommodation are defined as the complementary components of adaptation. The terms are used descriptively to denote processes that involve 1) the imposition of structure on whatever objects and events are being considered, and 2) the revision, construction, or curtailment of structure in response to objects and events that cannot be assimilated to existing structures. All learning, Piaget tells us, involves assimilation to structures and, clearly, development proceeds through a series of accommodations. The terms are useful to describe processes that occur in normal cognitive life – just as digestion, respiration, and circulation are terms useful in the description of physical

life.

But I wonder whether these terms can be converted into adjectives and used meaningfully to modify nouns such as "behavior," "act," or "mode." My guess is that a strong case might be made for "assimilative mode" or "accommodative mode," but that "assimilative behavior" or "assimilative act" might introduce real difficulties. It is credible to suppose that our cognitive life might be dominated for a while by mental activity that might be described as "assimilative." In such a mode, we might try repeatedly to lay selected structures on a problematic situation. If this mode were to be dominated by the repeated application of *one* structure to a recalcitrant situation, we would be guilty of perseveration. But in deciding that a mode is dominantly assimilative or accommodative, we must hear a great deal about what is going on inside the person who is *in* such a mode. We might make a serious effort to find out what is going on by using some variation of overt thinking. Even if, at the end of such a session, we were able to say with confidence that assimilation and accommodation had taken place, it would surely be enormously difficult to separate the acts or episodes within the protocol into "assimilative acts" and "accommodative acts."

The use of expressions that join adjectives properly used in the cognitive/mental domain and nouns properly used in the physical/behavioral domain is a risky business. In a non-dualist interactionist framework -- or under a "double aspect" view – it may be possible to legitimize the combination, but this requires a real analytical effort. When we simply put the terms together and assume that something is meant by the resulting expression, meaning itself becomes almost wholly a matter of individual interpretation. A major difficulty in the interpretation of Piaget's work is that this sort of thing happens repeatedly. Clear-cut distinctions such as competence/performance, cognitive/affective, assimilation/accommodation, structural/random are all more appropriately used in dualistic rationalist frameworks. The terms need careful revision and elaboration if they are to be used effectively in a non-dualist framework.

It seems clear that Piaget was aware of many of these

problems. His effort in *Biology and Knowledge* and other works was directed toward an investigation of the total human organism. He did not intend to use physical life as a simple metaphorical domain through which to describe mental life. His careful attention to the total organism functioning as one physical/mental system led him naturally to methods that constrained as nearly as possible the influence of other organisms. He quite properly said little about pedagogy (in which we must make inferences from teacher behavior (a) to student cognitive structure (b) to student behavior (c) or from (a) to (c) to (b), and some would say that he improperly neglected the influence of the interviewer in obtaining his protocols. But, while there is evidence that he was aware of the problems under consideration, he did not show his awareness in a careful use of language. Where Dewey was often meticulous in converting terms to his own framework (certainly this was not always the case, for established language presses us remorselessly), Piaget continued to labor under the influence of rationalist and Kantian language. What is needed, then, before Piaget can be applied effectively in classrooms is a series of studies that analyze Piagetian language and its relation to pedagogical language. We need to be sure that the Piagetian terms we hook onto our pedagogical ones are appropriate for that sort of connection.

Finally, if we decide to use "cognitive structure" in the pedagogically useful way suggested earlier, "assimilation" and "accommodation" would probably not be very useful. As soon as we recognize faulty structures in our universe of cognitive structures, "behaving in an assimilative/accommodative way" loses its status as something desirable. The product of accommodation may be anti-developmental. If *all* learning is assimilative, we should be far more concerned with the *kind* of learning – its power, what it tends toward, its content – than with the simple fact of its occurrence.

Conclusion

Those of us who accept a Piagetian developmentalist framework must engage in a rigorous program of re-defini-

tion, questioning, explication, and empirical research. Without restating the criticisms discussed earlier, the constructive heart of my suggestions may be summarized as follows:

1) A clear, pedagogically useful definition of cognitive structure is required. It should be compatible with a Piagetian framework.

2) Equilibration should be reconsidered. In particular, we should examine the possibility of anti-development, that is, the construction of faulty structures.

3) Much more attention should be given to specific curricula of the sort described by Professor Doll. Instead of looking at these as *applications,* we should use them as stepping stones to analysis: can they be described using Piagetian language? What makes them successful or unsuccessful?

4) Each combination of Piagetian and pedagogical terms should be analyzed thoroughly so that meaning is fixed as nearly as possible for these expressions. In doing this work we should ask (at least) two sorts of questions: is the resulting expression meaningful and compatible with Piagetian thinking? Is it meaningful for pedagogy?

* * *

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Bergamo.

If you can attend only one conference this year, ...

WHY IS PIAGET SO HARD TO APPLY IN THE CLASSROOM?

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In "Curriculum and Change: Piaget's Organismic Origins," William Doll has analyzed "four separate but interrelated points." While it is tempting to say something about each of them, it may be more profitable to examine one of them in some depth. His last point was "to examine and outline some of the curricular and instructional implications of a structuralist view," and it is this point on which I shall concentrate. My remarks will be organized under three topical headings: Cognitive Structures, Equilibration and Dynamic Factors, and Difficulties with Assimilation/Accommodation. I should say at the outset that most of the problems to be discussed here are located in Piaget's theories themselves and not in Doll's interpretations of them.

Cognitive Structures

In a recent paper, D. C. Phillips (1982) summarized a number of the liveliest disputes over "cognitive structures." Among the thorniest and most interesting problems, one of considerable concern to Phillips, is how we can infer from performance what sort of "cognitive structure" has been activated. Related to this are questions about the claimed universality of certain basic structures and the usefulness of these structures (if they exist at all) for pedagogical purposes. These are obviously important questions. They boil down to a skeptical demand for answers to fundamental questions: What *are* cognitive structures? (What is their form? their content?) How can we identify them in individual sub-

jects? What can we, as teachers, do about them once they are identified?

Doll quotes me, correctly, as having said that the purpose of curriculum and instruction must be "the transformation of cognitive structure and not just mastery of a task" (Doll, p. 41; Noddings, 1974, p. 360). What I had in mind at that time was a view of cognitive structure that includes the following: 1) a thorough description of the context of performance from which inferences are to be made; 2) a description of the heuristics employed; 3) a description of the routines involved; 4) a structural picture of "cognitive structures" constructed from the first three components. This process involves making inferences, of course, but over a much narrower range and to a lower level of abstraction than Piaget's general intellectual structures. I still think it is likely that, in a given situation involving a well-defined task, a finite number of effective and ineffective cognitive structures may be identified and described. But I have doubts about both the unversality and usefulness of structures described at a level of abstraction that neglects both the nature of *elements* in the structure and the nature of the *performance situation*. This is not to say that I would discard notions of *competence*; rather, it is to say that I would define the structures of competence much more narrowly and specifically. Further, I would not suggest that certain dynamic factors and beliefs be included in the description of cognitive structure, and I'll argue for such inclusion a bit later.

Professor Doll seems to accept Piaget's claims for the universality of intellectual structures and their tendency to develop toward the logical. He says: "Further, structures have a teleonomic tendency to develop towards the logico-mathematical; thus, there is a sense of universality about structures." (p. 44). Now, this is just what I am inclined to deny. There may be some structures that develop in all of us -- in, that is, an "epistemological subject" -- but such structures, if they exist, are relatively useless for pedagogy. At most, they might be used to make decisions about when to teach certain things, but their usefulness would be restricted to childhood education. Of what positive use is

the description of a stage of formal operations? If we accept it, we would refrain from teaching prematurely those things that require such operations, but we receive no guidance on how teach students who are already in that stage. The differences in how people, all supposedly at the stage of formal operations, approach intellectual problems are obviously great. If the notion of cognitive structures is to be useful for curriculum and instruction, it has to be elaborated in a way that captures these differences and helps in assessing the relative strengths and weaknesses of the structures identified.

Now, in fairness, Piaget said a great deal about how cognitive structures *are formed*, and his descriptions should be relevant to the structures with which educators are concerned. But he said almost nothing about how we should *describe* these structures. On this point, we have only a highly abstract, mathematical description of general intellectual operations. When we try to make educational applications of this description, we fall into an error analogous to that made by many proponents of the "new math": we suppose that *form* can be accurately descriptive without content. Let me illustrate the kind of error I'm talking about. In trying to approach mathematics through fundamental principles and structures, we emphasized such properties as the commutative, associative, and distributive laws. We wanted students to understand *commutativity, associativity,* etc. But very few people achieve such an understanding, and it may be that the level of understanding will always and inevitably be tied to the actual elements under manipulation. Consider this problem:

> Suppose we define an operation * on the set of integers as follows: $x * y = x + 2y$. ($b * a = b + 2a$; $z * x = z + 2x$, etc.) Is * commutative?

Now, it has been my experience that the vast majority of students (college or senior high school) cannot handle such a problem. Most do not know where to begin. All of these students know that $2 + 5 = 5 + 2$, that one-fourth times three-sevenths equals three-sevenths times one-fourth, and even that $(a + b)(a - b) = (a - b)(b + a)$ if "a" and "b" are real numbers. But that does not mean that they "understand commutativity." Faced with the problem above,

typical responses are: 1) "Yes, because addition is commutative." (Here the student supposes that because $x + 2y = 2y + x$, $x * y = y * x$.) 2) "What is '*'? Is it addition?" 3) "What are 'x' and 'y'?" A very few students realize that they must show that $x * y = y * x$ in order to establish the commutativity of *, and not all of these can go on to show that * is not, in this case, commutative.

There are two points to be made in light of this example. One is, of course, that we should be very careful about the language we use if we want to be sure to convey meaning reliably. When we talk about teaching students to measure, to classify, to conserve and the like, we should add *objects* to our verbs; students learn to measure, e.g., length of line segments in certain units, to classify sea shells of a limited kind, to conserve volume of liquids. Similarly, when they learn something about the property of commutativity, they learn that addition of natural numbers is commutative, etc. When we consider extending a skill, property, or principle to another level, we always have to ask what role is played by familiarity with the objects under study. The notion that "learning the fundamental principles" leads rapidly to transfer and hence to the frontiers of knowledge is an optimistic notion but one that is, so far, with little foundation. Even at sophisticated levels of mathematical work, a great deal of playing with concrete objects (very sophisticated concrete objects that would seem highly abstract to most of us) is required. The willingness to engage in the selection or construction of such objects, the skill in manipulating and observing their behavior, the realization that all this *is* "mathematical behavior" -- all these things are part of the cognitive structure of mathematicians. So my second point is that we need to describe activities typical of various disciplines not only in terms of the *results* that are obtained and organized through them but in terms of the activities themselves: the questions that give rise to certain moves, the standard nature of certain strategies, the ways in which to conduct orderly investigation.

Clearly, this emphasis on construction, manipulation, and observation is not anti-Piagetian. On the contrary, it is in line with Piaget's lengthy descriptions of how cognitive

structures are formed. But it leads us to consider the formation of structures that are *not* typical of the "logico-mathematical" in the normative sense. These structures resemble the logico-mathematical in their systematic functioning, but they are either limited in what they can produce or they actually produce wrong answers. Why should we suppose that purposeful activity, repeatedly engaged, must necessarily be internalized in structures that are actual structures of mathematics?

What I am suggesting is that a useful view of cognitive structure must include psychological components that differentiate it from logical structure. A *cognitive* structure is not just an accurate replica of logical structure. It is not even a mere faulty version of some logical structure. It is that which reveals the *genesis* of logical structures in human mental activity. If we present ten concepts to our students and ask them to organize these concepts into some sort of structural picture, perhaps a tree, we cannot suppose that the resulting structure is an accurate reflection of cognitive structure. (See Phillips, *op. cit.*) If we withhold the concepts and, instead, present a situation that would call forth these concepts from experts, the concepts might not appear at all, or some of them might appear in odd concatenation with others we have not even considered. It seems reasonable to insist that descriptions of *cognitive* structure should reveal the genesis of both logical and faulty organizations of subject matter. Surely not every chain of "developing" cognitive structures tends toward the logico-mathematical.

One reason, then, that Piaget is hard to apply in the classroom is that we have not developed a sound and useful method by which to describe the cognitive structures of learners. This methodological gap is revealed in Doll's description of his own work. He describes the intentions of the structural approach as follows:

> 1) We would pay attention to children's structures;
> 2) we would present arithmetic material in a structural or patterned form, and in a manner which allowed children to operate or act in an assimilative - accommodative way;
> 3) we would encourage the children to construct –

alternatives, extensions, patterns. (p. 45)

What does paying "attention to children's structures" involve? We are told quite a lot about the *presentational* structures of the curriculum but almost nothing about the diagnosis of "children's structures." It is entirely possible that the patterned activities are themselves important simply as prototypes of mathematical activity and not because they induce changes in "cognitive structure." Now, as a matter of honesty, I suspect they *do* induce such transformations, but I do not see how we can prove such a hypothesis without a sound definition of cognitive structures. Before continuing the discussion of what it is in "cognitive structures" that makes Piaget hard to apply, I should mention that statement (2) above involves another important problem that I shall return to: what does it mean to "act in an assimilative - accommodative way"? Does it make sense to talk this way about cognitive structures whose content is mathematical?

Besides the lack of an unequivocal definition of "cognitive structure," there is something else that makes the concept difficult to apply: the notion that one really does not have to do much about faulty structures except to identify them and bring them to the consciousness of their owners. Doll, for example, says:

> It is not necessary or even productive for the teacher to worry excessively about mistakes, for once the individual knows a mistake exists there is a natural predilection for the individual to correct it (for the regulatory mechanisms to work). (p. 48)

This seems to be an accurate interpretation of Piaget, but Piaget may be dead wrong in this. Indeed, many years of teaching mathematics suggest to me that he *is* wrong in this. Strictly speaking, what Piaget suggests is that "re-quilibration" will be triggered and on this we might agree, but the complete body of his work suggests (and Doll's use of "correct it" reinforces this) that re-equilibration will result in something "better" – something tending toward the mathematically acceptable. I think there is reason to doubt this and, in the next section, I shall point to some evidence that supports this doubt.

When we do encounter instances susceptible to Piaget's

description of re-equilibration in mathematical activity, we are hard put to find a role for pedagogy. Consider this example: Danny, age seven, still uses the "sum model" for addition. To add 7 and 5, he manually or visually picks out 7 objects and then 5 objects, puts them together, and counts from 1 to 12 to produce the answer. [A case like this is described in a recent dissertation by Susan Shipstead (1982).] Most of his second-grade classmates use the "min model": they start with 7 and add on 5, saying, "eight, nine, ... twelve." It is highly unlikely that Danny will adopt the "min model" simply because we show him the limitations and frustrations involved in using the "sum model." In fact, most of our evidence suggests that he will not. Now is this because the "sum model" represents a stage-specific form of intellectual functioning and is, therefore, resistant to anything that may hasten it? Is it simply impossible to introduce any *dis*-equilibrium in such a case?

I think we need to study questions of this sort openly and deeply. Too often we leave our analyses in a destructive state when what we badly need is a constructive effort. What kinds of tasks fall under the constraints of stage specific functions? What sort may yield to clever interventions? Claims that we can teach anything to anyone ... and claims that we cannot teach some things at certain stages (regardless of preparation) both invite challenge. What might we do, for example, with Danny? Some teachers have tried this with success: just as the youngster begins to push the two sets together, hold his hand over the first set of objects and ask him how many are there. Then direct him to pretend he's counted that far and go on. Will this always work? I certainly do not know. Is it important that we use the child's *own hand* to cover the objects? Again, I do not know, but those of us who find something that rings true in the writings of Piaget are likely to think so. The child's own action is instrumental; if *we* make the decision to act, as in this case, we may still try to preserve the child's own *touch*.

The case we have just considered is an important one because it represents a *bona fide* case of potential equilibration in Piaget's description of mathematical structures.

The original structure *is* a mathematical structure; it is not a faulty cognitive representation of mathematical objects. But it is limited and clumsy; it needs extension to more efficient and encompassing structures. Even in such situations, simply exposing the limitation of the method is not sufficient for equilibration in the direction of "better structures."

A more important practical question is whether simply exposing an error or faulty structure (as opposed to a proper but limited one) is sufficient to trigger movement in a "better" direction. The idea has been with us at least since Spinoza, and it was certainly echoed in the work of Freud. Interestingly, these were deterministic systems and the only possibility for change within them was realization of the cause of error and active concentration on some available, more adequate scheme. [This underscores the credibility of Sophie Haroutunian's complaint about Piaget's treatment of equilibration in open systems. (1980).] But such thinking is still with us and not only in Piaget. We see it today in the work of researchers interested in diagnosis. The *Buggy* program of Brown and Burton (1978), for example, is designed to help teachers learn to diagnose faulty algorithms in arithmetic. The assumption is that faulty structures as well as appropriate ones exist and if we can identify faulty structures, we have a chance to eliminate *systematic error.* Clearly, this is very like inducing a transformation of cognitive structure. But Brown and Burton have so far not addressed questions of remediation; it is not clear whether they think, along with Piaget, that if we once see that something is wrong, we will correct it, and so all the teacher needs to do is bring the faulty algorithm to the attention of the student using it.

I want to raise further questions about equilibration but, before pursuing them, I want to make clear what I am trying to by proceeding in this fashion, using concrete questions and suggestions. I feel, in agreement with Professor Doll, that there may be much of practical use in Piaget's work. But I think that we need to examine his claims and particularly the terms in which they are cast very carefully to find out just how they might be applied in practice. We must

continue to ask: what does this mean? Does this agree with our concrete experience?

In concluding this section, I'd like to suggest a concrete but tentative definition of cognitive structure. A *mathematical* structure is usually described in terms of a set of elements together with one or more operations and a set of rules describing the behavior of elements under these operations. In shorthand, we describe a structure "S" as: "S" = (S,⊕) where S is a set of elements and ⊕ is an operaton on S governed by precisely stated rules. This is the way in which Piaget also describes cognitive structures, and I have agreed with D. C. Phillips and others that this approach is almost certainly in error. Alternatively, we might define a cognitive structure as a system = (C, P, S; ⊕, ⊙, . . .) in which C represents contextual elements; P represents psychological (particularly dynamic or motivational) elements; S represents the objective elements as identified, labeled, and manipulated by the subject; and ⊕, and ⊙, etc. are operations applied to S. The application of these operations would, of course, be described by a set of rules or transformations but these would include *heuristic* rules as well as the sort which, mathematically, guarantee an objectively satisfactory result. It is entirely possible in such a system to have an operation or algorithm that is "buggy" -- that is, one that will *not* consistently produce correct answers. It is also possible that a perfectly good algorithm will be heuristically employed unproductively -- in a situation to which it does not apply. It is clear, further, that the elements represented by C, P, and S might themselves be systems, so the picture is very complex.

Now, of course, from some philosophical positions, it is unacceptable to include either contextual or psychological elements in the conceptualization of *cognitive* structure. Contextual elements are, it is contended, "out there," while cognitive structures are internal; similarly, the sort of psychological elements I have suggested would be labeled "affective," and these must be separated from the "cognitive." But, interestingly, there should be no such objections raised in a Piagetian interactionist framework. Context is not wholly external from such a viewpoint, nor is cognitive

structure totally internal for they are joined in the indissociable bond that defines both subject and object. Hence, I would argue strongly for a definition of cognitive structure that builds solidly and thoroughly on an interactionist (or, better, transactionist) foundation.

If one considers the complex system suggested, it is obvious that much of our work must involve context-dependent transformations. What a learner does in one situation may be different from what the same learner does in another situation. How different? What kinds of heuristics are regularly employed by particular learners? What sorts of systems are facilitative in the sense that they *do* seem to be precursors of true mathematical structures? What sorts (if any) are anti-developmental in the sense that they contain self-conserving rules that resist change? We could go on generating important questions, but this may be enough to suggest the substantial revisions that are required in Piaget's description of cognitive structure.

Equilibration and Dynamic Factors

Here we face two problems foreshadowed earlier. The first is theoretical and the second practical: 1) what reasons have we for supposing that successive equilibrations tend toward logico-mathematical (or "better") structures? 2) What can we as teachers do to induce better structures through equilibration?

Piaget anchored his theoretical argument in what seems to be an elaborately sustained organismic metaphor. Indeed, he carried this metaphor so far and so effectively that he was able to write persuasively of "cognitive organs." But, of course, we cannot isolate or dissect such "organs" physically, and we must be cautious in stretching a metaphor to provide a theoretical ground. Even if equilibration and autoregulation are well established in biology, we still must ask whether they are facts of cognitive life. Another very important question to ask is whether equilibration can be applied as Piaget suggests to all cognitive structures whose content is mathematical or whether it only makes sense to speak of equilibration with respect to actual mathematical

structures. Speaking of accommodation in the production of new cognitive structure, Piaget says:

> There is, however, an exception, and it is the one which has been most difficult to integrate into the usual biological systems: the major exception of logico-mathematical structures, extremely important in itself, and all the more so because such structures produce the chief assimilatory schemata utilized in experimental knowledge. Logico-mathematical structures ... (develop) ... without a break in such a way that no new structuration brings about the elimination of those preceding it; ... (1971, p. 355)

Further,

> ... logico-mathematical structures involve a sui generis equilibrium situation with regard to the relationship between assimilation and accommodation. On one hand, they appear to be a continuous construction of new assimilation schemata: ... on the other hand, logico-mathematical structures give evidence of a permanent accommodation, ... (1971, p. 355)

This account makes it difficult to make any sense of of individual activities that might be called equilibration. An actual *mathematical* structure does, indeed, have the properties described by Piaget. It is not subject to "revolutions" but only to evolutions -- successive embeddings and extensions. But an individual's cognitive structure with respect to mathematics may *not* be a mathematical structure. Can we then describe what happens through successive changes in terms of "equilibration"? Can we depend on successive "re-equilibrations" to bring about changes for the better? What is the nature of cognitive equilibration? What happens when we are confronted with an anomaly, with something that gives rise to dissonance? The first thing we must ask is this: what *causes* dissonance? Do we all react with a sense that "something is the matter" to the same kinds of presentational anomalies, or do some of us placidly shrug off what bothers others intensely? The answer to this seems, obviously, to be that there is wide variation in what disturbs the cognitive balance of individuals. If the development of intellectual structures is the result of equilibration and if

some of these intellectual structures are universal, it must be the case that at least some forms of dissonance arise universally or very nearly so. It is in this matter that Piaget has been accused of neglecting the social factors that press certain forms of dissonance upon us and that, also, continue to press us until we arrive at a "better" structure.

Now if, in fact, it is primarily social factors that determine whether we experience dissonance and under what sort of responses we can be relieved of it, then we really need to study carefully the conditions which give rise to responses by which persons attempt to dispel it. Is it possible that equilibrium can be achieved through a set of errors? It certainly *seems* possible. John Dewey, for example, saw the possibility clearly and insisted on distinguishing between that which is "satisfying," what gives us subjective equilibrium, and that which is *"satisfactory,"* what satisfies the problematic situation and brings equilibrium to *it*.

Clearly, if equilibration can result in faulty structures as well as logically acceptable ones, teachers must be *very* concerned with mistakes and must stand ready continually to arouse in the student the sense that "something is the matter" so long as something *is*, objectively, the matter. Without this constant nagging from objective authority, the student is very likely to achieve peace of mind willy-nilly. We already have some impressive evidence that this happens, and we are likely to accumulate much more as investigations involving protocol analysis continue.

Consider the case of "Benny" reported by S. H. Erlwanger (1973). Benny was quite able to reconcile dramatically different answers by using a set of faulty heuristics. For him, .5, 3/2 and 2/3 were all equivalent! Since the numerators and denominators added to 5, the conversion of either 3/2 or 2/3 to .5 was accomplished in a way that satisfied Benny. He used a basically sound mathematical insight -- namely, that there is often more than one form of a correct answer -- to justify answers that should have caused immediate consternation. Since the answer key exhibited only one form, Benny continued to believe that his wrong answers were really right and needed only conversion to the selected answer form. The entire account of Benny's mis-

conceptions is too lengthy to consider in detail here, but these features of it are important for the present discussion: 1) his wrong answers were *systematically* generated; 2) he expressed a fundamental belief that enabled him to resolve discrepancies; and 3) the "re-equilibrations" he made under his fundamental belief were tending toward the formation of structures that were unmathematical. With respect to this last feature, the development of faulty structures, we might predict that poor Benny will be forever lost in the world of mathematics.

The first lesson that I would extract from our encounter with Benny is two-fold: first, what is learned does seem to be internalized in structures; second, the structure formed need not tend toward the logico-mathematical. A question arises immediately concerning what we mean by "structure" when we refer to something that is not and cannot be called "logico-mathematical." Well, Benny's methods *are* structurally generated: there is a set of elements, a set of operations, and a set of rules that govern the behavior of the elements under the given operations. But his system is not logically connected to the fundamental concepts of number. If the elements of his structures are considered to be *numbers*, then his rules are demonstrably wrong. If his rules are considered to be legitimate, then the symbols upon which he operates are not numbers. This underscores again the need to describe the content of structures.

The fact that his errors are systematically generated makes our task as teachers extremely difficult. If Piaget was right in his description of how such structures are formed, it will not be an easy task to transform Benny's structures. Benny has gone at the tasks presented to him *purposefully;* he has experimented and assessed results. Every time he is confronted with dissonance, he finds a way to subsume the inconsistency under his fundamental rule: his own answer is a variation of the *listed* correct one. Our pedagogical task is to convince him that not all rule-generated answers are equivalent to a given, sanctioned one. This involves, I think, a thorough re-education with respect to the elements of the structure; Benny needs to know something about *rational numbers as numbers.* If, for example, he were taught to

count by 1/3's: 1/3, 2/3, 3/3, 4/3, ... , and to match the numbers thus attained with those recorded on a whole number scale and on a half-interval scale, he would surely see that 3/2 does not equal 2/3 does not equal .5. What can a child be thinking when he supposes that 3/2 = 2/3? Surely, his mind has been entiredly focused on rules of manipulation at the neglect of any consideration whatsoever of the *things* being manipulated. His rules work very nicely on objects that exist only temporarily and have no mathematical meaning.

I have been using Benny's case to illustrate what I take to be errors in Piaget's account but, pedagogically, we might use the same case to argue more strongly *for* a Piagetian approach. Benny received his mathematical education in IPI (Individually Prescribed Instruction), and the dissonance he encountered was always the same; it involved whatever appeared on the answer key. Hence Benny had only to construct some rule that would allow him to convert his answer into the sanctioned one. The major fault, then, seems to lie in the system by which Benny was taught.

I think part of the problem does lie in the peculiarly flat, non-communicative nature of IPI. But we, as adherents of Piaget's basic doctrines, must acknowledge that there is nothing in Piaget's theoretical pronouncements to block the results we have just observed. Dissonance and re-equilibration should produce a "better" structure. Clearly nothing of the sort is happening, and Benny's high-school teachers will throw up their hands. It is not just dissonance and re-equilibration that are needed, but the right sort of dissonance and the right sort of re-equilibration, and the initial structure needs to be a *mathematical* one if we are to speak sensibly of equilibration without accommodation. Benny needs to be convinced that what he is doing does not work and to accomplish this, he needs to know how the objects under study are supposed to behave. How would I know that a burned-out light bulb was faulty if I did not know that it was supposed to give light?

It seems to me that the great strength of Piaget's description of cognitive structure lies in his emphasis on reflective abstraction, in the connections among purpose,

action, reflection, and internalization. But here I would turn as happily and confidently to Dewey as to Piaget. I would not have so tidy an account of mathematical necessity, one must admit, but I would have a far clearer account of what I as a teacher must do. Under such direction, I would not interfere with the child's legitimate purpose nor his testing of hypothesized means and ends, but I would continually raise questions about his choices: suppose we tried that on objects of this sort? Suppose we left out step X? What if outcome Y had occurred? Would method Z work as well?

It is in this process -- what Martin Buber refers to as "the questioning glance, the raised finger" -- that the teacher's artistry is displayed. It is not surprising that Professor Doll's structural methods worked best with the brightest students. They, of course, interpreted dissonance in mathematical terms. That is why they are "brightest." The other students did *something* with the dissonance they experienced. What did they do and how will their re-equilibrations serve them in the future?

I suspect, because I have seen Professor Doll's structural curriculum in operation, that pedagogical artistry is very much at the heart of its success. In particular, the great strength of his curriculum is that -- through sound presentational structures and their gradual extension -- children are likely at every stage to develop true, even when limited, mathematical structures. They are not likely to suffer the fate of Benny because Benny-like structures are blocked by the nature of the interactions the curriculum presents. We should conduct a thorough investigation of what goes on in such projects. Here we have a teacher's act, a student's response (or vice-versa); a set of materials, characterized thus and manipulated so, with such-and-such effects. Describe it all meticulously and concretely. Then we might move cautiously and *tentatively* up the ladder of abstraction. How might we describe this activity just a bit more generally? How might we extend the set of objects? How might we expand the repertoire of actions? Armed with this new description as hypothesis, we must then return to the field of concrete activity. What happens now? Has the range

of unfelicitous possibilities expanded?

What we are discussing here is a matter of greatest importance socially and ethically, as well as epistemologically and psychologically. What creates dissonance? How is it that people – technologically literate, religiously educated people – can kill whole populations to achieve "peace"? How is it that parents – conscientious, loving parents – slap their children smartly to "teach" them not to hit others? How is it that obviously intelligent children can decide that 3/2 = 2/3 = .5?

I do not think that we shall be able to sustain the notion that structures tend naturally toward the logico-mathematical. Only logico-mathematical structures do so. Much more attention must be directed toward dynamic factors, toward what people *want* and what they are willing to do to achieve their wants. If peace means that all enemies are dead, then killing is an effective way to achieve it; if not hitting means not doing it in our judgmental presence, then hitting the hitters is a good way to achieve this. And if getting .5 is the goal of mathematical activity and I have a way of making 3/2 into .5, then whatever rule I concoct is a right handy one.

Difficulties with Assimilation/Accommodation

We must now face the conclusion that, since equilibration is not all that much help in describing the development of mathematical cognitive structures in individuals, we must depend on adaptation.

Assimilation and accommodation are defined as the complementary components of adaptation. The terms are used descriptively to denote processes that involve 1) the imposition of structure on whatever objects and events are being considered, and 2) the revision, construction, or curtailment of structure in response to objects and events that cannot be assimilated to existing structures. All learning, Piaget tells us, involves assimilation to structures and, clearly, development proceeds through a series of accommodations. The terms are useful to describe processes that occur in normal cognitive life – just as digestion, respiration, and circulation are terms useful in the description of physical

life.

But I wonder whether these terms can be converted into adjectives and used meaningfully to modify nouns such as "behavior," "act," or "mode." My guess is that a strong case might be made for "assimilative mode" or "accommodative mode," but that "assimilative behavior" or "assimilative act" might introduce real difficulties. It is credible to suppose that our cognitive life might be dominated for a while by mental activity that might be described as "assimilative." In such a mode, we might try repeatedly to lay selected structures on a problematic situation. If this mode were to be dominated by the repeated application of *one* structure to a recalcitrant situation, we would be guilty of perseveration. But in deciding that a mode is dominantly assimilative or accommodative, we must hear a great deal about what is going on inside the person who is *in* such a mode. We might make a serious effort to find out what is going on by using some variation of overt thinking. Even if, at the end of such a session, we were able to say with confidence that assimilation and accommodation had taken place, it would surely be enormously difficult to separate the acts or episodes within the protocol into "assimilative acts" and "accommodative acts."

The use of expressions that join adjectives properly used in the cognitive/mental domain and nouns properly used in the physical/behavioral domain is a risky business. In a non-dualist interactionist framework -- or under a "double aspect" view – it may be possible to legitimize the combination, but this requires a real analytical effort. When we simply put the terms together and assume that something is meant by the resulting expression, meaning itself becomes almost wholly a matter of individual interpretation. A major difficulty in the interpretation of Piaget's work is that this sort of thing happens repeatedly. Clear-cut distinctions such as competence/performance, cognitive/affective, assimilation/accommodation, structural/random are all more appropriately used in dualistic rationalist frameworks. The terms need careful revision and elaboration if they are to be used effectively in a non-dualist framework.

It seems clear that Piaget was aware of many of these

problems. His effort in *Biology and Knowledge* and other works was directed toward an investigation of the total human organism. He did not intend to use physical life as a simple metaphorical domain through which to describe mental life. His careful attention to the total organism functioning as one physical/mental system led him naturally to methods that constrained as nearly as possible the influence of other organisms. He quite properly said little about pedagogy (in which we must make inferences from teacher behavior (a) to student cognitive structure (b) to student behavior (c) or from (a) to (c) to (b), and some would say that he improperly neglected the influence of the interviewer in obtaining his protocols. But, while there is evidence that he was aware of the problems under consideration, he did not show his awareness in a careful use of language. Where Dewey was often meticulous in converting terms to his own framework (certainly this was not always the case, for established language presses us remorselessly), Piaget continued to labor under the influence of rationalist and Kantian language. What is needed, then, before Piaget can be applied effectively in classrooms is a series of studies that analyze Piagetian language and its relation to pedagogical language. We need to be sure that the Piagetian terms we hook onto our pedagogical ones are appropriate for that sort of connection.

Finally, if we decide to use "cognitive structure" in the pedagogically useful way suggested earlier, "assimilation" and "accommodation" would probably not be very useful. As soon as we recognize faulty structures in our universe of cognitive structures, "behaving in an assimilative/accommodative way" loses its status as something desirable. The product of accommodation may be anti-developmental. If *all* learning is assimilative, we should be far more concerned with the *kind* of learning – its power, what it tends toward, its content – than with the simple fact of its occurrence.

Conclusion

Those of us who accept a Piagetian developmentalist framework must engage in a rigorous program of re-defini-

tion, questioning, explication, and empirical research. Without restating the criticisms discussed earlier, the constructive heart of my suggestions may be summarized as follows:

1) A clear, pedagogically useful definition of cognitive structure is required. It should be compatible with a Piagetian framework.

2) Equilibration should be reconsidered. In particular, we should examine the possibility of anti-development, that is, the construction of faulty structures.

3) Much more attention should be given to specific curricula of the sort described by Professor Doll. Instead of looking at these as *applications,* we should use them as stepping stones to analysis: can they be described using Piagetian language? What makes them successful or unsuccessful?

4) Each combination of Piagetian and pedagogical terms should be analyzed thoroughly so that meaning is fixed as nearly as possible for these expressions. In doing this work we should ask (at least) two sorts of questions: is the resulting expression meaningful and compatible with Piagetian thinking? Is it meaningful for pedagogy?

* * *

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* * *

Bergamo.

If you can attend only one conference this year, ...

CHANGE IN THE CURRICULUM CONCEPT: A COMMENTARY ON DOLL'S "CURRICULUM AND CHANGE"

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I find Professor Doll's account of the underlying epistemology of Piaget's organicist view of change compelling, useful, and thorough.[1] The arguments that trace the evolution of this concept of change are unexceptionable in my view. The discussion of what might be called the pre-science or pre-Newtonian epistemologies are useful for the context it provides to understanding the conceptual upheavals of the second half of the past century. Professor Doll paints this context well, so that the metaphysics of regulatory natural laws that underlie Newton's and Newtonian thinking are plainly seen to fit the prevailing theology of the Grand Design. While this treatment is as important as it is satisfying, it is less important than the careful comparison Professor Doll makes between the educational offspring of the mechanistic, reductionist view and the curriculum implications of thinking about curriculum matters in an organismic framework such as Piaget's. As I have said, all of this is useful and compelling, but what I find intriguing about the paper is not so much in the body of the arguments themselves but in how they afford a reader the means to connect various strands of educational research and thinking that might otherwise remain separate. In the following, I want first to capitalize on the opportunity to do some of this knitting, principally by extending the purview of Professor Doll's points about the concept of change. Then, I wish to show

that his paper opens up a rather unexpected area of inquiry, because it became evident as I worked through the consequences of Professor Doll's thinking that the meaning of "curriculum" he adopts permits the argument's consequences to run into difficulties. I believe this feature of the paper is important for how it seems to place "curriculum" within the topology of educational thinking, and so an attempt is made later to open up this inquiry, at least embryonically.

Extending Professor Doll's Distinctions

Here I want to suggest that, if Professor Doll's views of the mechanistic and organismic conceptions of change ring true, then we ought to be able to use them productively to see differences in other areas of human change. In this way, by broadening the range of applicability, we open his distinctions to a wider range of test cases. Of course, the focus in "Curriculum and Change" is upon the child, and this is appropriate for several reasons. First, the work of Piaget and Piagetian scholars has been and still is directed at understanding the facets of intellectual development during the early years, and so it is not surprising that this work has appealed to educators. Unfortunately, there is a quantity of what could be called the "Americanization of Piaget" in the literature of curriculum and instruction, especially in the sciences, which finds the researchers forcing an organicist worldview into a mechanistic one.[2] Professor Doll's paper shows clearly that the two epistemologies that flow from these worldviews are immiscible. Second, it is around the notion of educational results that the differences between the conceptions of change are keenest and clearest. That is, if we want to understand why a behavioral account of change ("learning") in a child differs from a cognitive developmental account, then we need to inspect the origins of these legacies, and, as Professor Doll shows, these can be usefully traced to divisive developments in the physical and biological sciences at the turn of the century. Third, Professor Doll himself is of course interested in how an organicist approach to mathematics teaching might work, and the later portion of his paper provides the reader with an appetizing glimpse

of an approach to mathematics that replaces the learning of skills with a growth of understanding from which, presumably, the so-called "skills" can emerge. Professor Doll notes that a curriculum of this sort makes necessary demands upon teachers. They become curriculum-makers rather than curriculum-followers, and they must work in a fashion that maintains an "essential-tension" between the learners' structures and those in the public domain, as it were.

I first regarded this conclusion as straightforward, even self-evident, and by no means problematic, but, when I considered it more carefully, I recognized that it too speaks of change in a way that invites some applications of the concepts of change developed in the argument (change in learners) to the concept of change suggested in this conclusion, which is change in curriculum and in teachers.

In one view, curriculum change becomes virtually synonymous with curriculum innovation and implementation, a useful example of which can be found in Leithwood, Holmes, and Montgomery.[3] In two senses, this approach is systems-oriented. First, it considers change at the system level, the level of school or school board. Second, the work is an account of models of planned change in action, and the language suggests the reductionist lineage: client system, change agent system, curriculum user (rather than teacher), problem solving, social interaction model. None of this, of course, is presented here to castigate the approach. Instead, it is to draw attention to a possible extension of Professor Doll's explication of alternative views of change. Certainly, the field of research and development that focusses on curriculum change and innovation is more than well represented by studies and projects that are in harmony with a Newtonian conception of change and the "change process." The review of Fullan and Pomfret[4] and the comments by Olson[5] substantiate this point.

Organismic approaches to the matter of changing teachers and curriculum are less evident in the literature, yet a recent account suggests that marked changes in teaching approaches are intimately connected with changes in a teacher's thinking, and that these come about transitionally over time. Kilbourn, in "Linda: A Case Study in Clinical Supervision,"

accounts for the long time it took for Linda to alter one feature of her teaching: "If her attempts at improvement are looked at in terms of incremental development, then periods of 'behavioral dormancy' might well have been times in which she was assimilating the flood of information presented to (and developed by) her."[6] The information referred to here consists of transcripts of lessons and discussions of these by Linda and Kilbourn himself. Evidently, the teacher's own thinking, the teacher's constructions of his or her professional life and activities, become significant to an organicist or structuralist account of change at the level of curriculum and teaching. Olson's work on teacher constructs,[7] relying partly upon Kelly's Personal Construct Theory,[8] provides an important contrast to ways in which curriculum change has customarily been studied. As a framework to aid the study of teachers' thinking, Kelly's constructivist approach is especially useful, because the models most used in research on teacher thinking stem from decision-making and information-processing parents and are themselves distinctively mechanistic.[9]

Dilemmas in Conceptions of Change

At this point, it is easy to see that the conceptions of change advanced by Professor Doll vis-a-vis learning can be fruitfully turned to conceptions of change that occupy the literature of curriculum innovation and teacher change. This is appropriate, for the conceptions would be less than satisfying if they applied to a limited slice of the population. But it is within these connections that his approach begins to run into rougher water, and to see how this is we need to return to his conclusions about demands upon teachers.

Piaget's view of life as autoregulation has led Professor Doll to espouse a curriculum which not only makes demands upon teachers -- all curricula do that -- but also to some extent prescribes what teachers are to do. He argues, as noted earlier, that they must work to maintain an "essential-tension," and that they must become curriculum-makers rather than curriculum-followers. Now, there is nothing particularly disturbing in those prescriptions except when

they are inspected through the lens of autoregulation, because, when this is done, there appears a basic tension (if not a conflict) between prescribing the teacher's role and advocating an organicist approach to the curriculum. This is an important consequence of extending Professor Doll's arguments, and it is worth pursuing for the way it might have us regard the concept of a teacher's professional autonomy.

A useful way to reveal the difficulty is to introduce the concept "curriculum interface" which Roberts developed to explain the basic deficiency of "top-down" curriculum innovation strategies.[10] For Roberts, the interface is the meeting place of the constructed worlds of curriculum architect and teacher. The architect's world consists of constructions about the nature of the subject to be taught (sometimes the discipline's epistemology, then), about the nature of the learner, and about the nature of learning. The teacher constructs these domains too, though the constructions themselves are liable to be quite different in substance. This is, of course, where the trouble starts, because the major communication between the two sets of constructions (architect's and teacher's) is through the curriculum materials. The latter, which are a step removed from the architect's constructions, are then interpreted through the teacher's constructions – a further step removed -- and so the interface becomes the ground for considerable misinterpretation, reinterpretation, and, eventually, curriculum modulation. Hence we should never expect curriculum-in-use to correspond to curriculum-as-planned.

This places Professor Doll's proposals in a rather awkward position. They are to honor a constructivist account of knowledge and thought, but if they are to reach fruition as curriculum-in-use, they need to be the outcome of the thinking of teachers who share the organicist perspective with him. In this way, teachers do indeed become curriculum-makers. But, if teachers are not of such an epistemological persuasion, then the proposals meet with difficulty, because they may never reach a classroom. There is little point in resorting to a "top-down" strategy in such instances, because this would violate Professor Doll's wish that teachers refrain from being curriculum-followers copying the archi-

tect's constructions of reality – Robert's analysis suggests that this is unlikely to succeed anyway. So, unless the analysis of Professor Doll's curriculum implications is taken carefully, it looks as if their usefulness is confined to those who share his views in the first place. These individuals, one could say, have expressed their professional autonomy by considering the paper and deliberately aligning themselves with the paper's conclusions. Others, of course, may express their autonomy in a similar way by finding the arguments and conclusions untenable.

Although I do not subscribe to it, there is a simple escape from this predicament that ought to be mentioned for the sake of completeness. This involves an attempt to demonstrate that in significant and relevant respects the reductionist approach is inadequate for construing teachers, teaching, and learning, and that the organicism of Piaget and others provides the only satisfying account. The difficulties here are many: the constructionism in organicism seems to legitimate alternative constructions; it is by no means clear that the Newtonian paradigm is inappropriate in significant and relevant respects (a matter which Professor Doll himself acknowledges) -- possibly the Popperian test has yet to be designed and conducted; and it is far from evident that the perspectives afforded by Piaget, Waddington, Weiss, and others represent the last epistemological word, so to speak.

Putting this aside, we are still left with the puzzle of how to understand the implications of Professor Doll's conclusions without jeopardizing the tenets of his argument and the sentiments of professional autonomy.

The Elusiveness of "Curriculum"

Unfortunately, Professor Doll has offered no explicit escape from the dilemma into which I find his conclusions and implications have led me. Yet, right at the start of his work there is the occasion for reconsidering how the dilemma arose in the first place -- that is, aside from the devious and less than charitable retort that I invented it. The title of his paper contains the phrase "curriculum and change," and while much attention is given to analyzing the concept

of curriculum itself. He writes:

> The word curriculum will be used in a non-specific manner. I am comfortable with either the notion of a prescribed course of study, or a prescribed course of study plus methods of implementation. Either or both fit the comments I have to make. In talking of school curricula I am thinking of the textbooks and lessons developed from those that one sees in public school classrooms.[11]

The matter to be explored, then, is the extent to which the problems located in the conclusions and implications of the argument stem directly from this rather wide-ranging and broadly-painted characterization. And, instead of recapitulating the many definitions and meanings that abound in the literature, I propose to start with a recent account of this issue.

The analysis of curriculum prepared by Daniels and Coombs identifies what they call "subtle" features of the concept. [12] First, it conveys an indirect intention, because "the object of the intention is someone else's action,"[13] so, it does not cause learning directly, as might a brainwashing program. Notably, "both the experiences that students have and the activities they engage in that are unrelated to the intention to learn are extraneous to the curriculum they are following." Second, curricula are social phenomena, being "features of an institution, such as schools."[14] In this respect, they function as policies or, better, as rules. But, as the authors argue, the rules are incomplete, because they do not indicate how the content (not always specifically described) should be studied. Both these features hold implications for the present discussion.

The "indirect intentionality" of curriculum is a feature that seems entirely commensurate with a good many views about what the outcomes of a curriculum ought to be. If these outcomes are described in terms of learning, then it is easy to see that the indirect intention of the curriculum in question is to have learning occur. Opacity gets introduced in this otherwise transparent case when the focus shifts away from learning and toward the sorts of things Professor Doll describes, because it is not at all clear that when we talk

about the development of an individual's structures or constructs we are talking about learning. It is clear, however, that the structures, which come from within, are likely to be unique and unpredictable, and this might stretch the characteristic of "indirect intentionality" too much. I doubt that this feature of the curriculum concept is infinitely elastic, even though Professor Doll indicates that "curriculum is planned change,"[15] and so there will come a point at which we must ask if a Piagetian-type curriculum is *in principle* possible. Professor Doll's use of the word curriculum, then, leads us directly to questioning the relationship, if any, between different conceptions of the term and different conceptions of youngsters coming to grips with their environment – learning or constructing. And, even if the analysis of "curriculum" given by Daniels and Coombs fails to meet with universal agreement, it is certainly helpful for the fashion in which it highlights questions about what Professor Doll has in mind.

The "social rules" feature is similarly useful, though it addresses a different matter and leads here to a different set of puzzles. If we see the curriculum concept as necessarily involving institutional rules, then we are obligated to view the teacher as a rule-follower. In fact, the more a curriculum is prescribed institutionally, the more-rule-following is presumably expected of teachers, and this shows plainly that a normal concept of curriculum sets boundaries to the professional autonomy that a teacher may wield. This line of reasoning I take to be quite a odds with Professor Doll's urging that teachers be curriculum-makers. His argument's implications for curriculum push us to asking if a teacher can have (that is, in principle) the range of autonomy that permits the transition from curriculum-user to curriculum-maker. In a sense, this is like asking Professor Doll to explore with us what he sees the curriculum-maker's task and attendant professional autonomy to be.

Schooling and Education: The Crux of the Matter

It is the thesis of the National Film Board of Canada's *The Invention of the Adolescent* that the introduction of

child labor laws to regulate the work force, the nineteenth century's romantic idealization of childhood, and the introduction of compulsory schooling have contributed substantially to the development of what we have come to call adolescence.[16] More specifically, the placement of children in schools, which effectively removes them from access to the adult world of work and play, when coupled with the institutionalizing of such significant human events as birth, sickness, and death, has emphasized the differences between child and adult. Compared to the children of previous centuries, children today, the National Film Board suggests, have been insulated from the traumas that beset adults and from the pleasures in which they indulge. Adolescence, then, is not just a transition from childhood to adulthood, but a transition characterized by the onset of both physical and intellectual adult capabilities in the absence of experiences that are significant to construing the adult world. In organismic terms, we might say that adolescence is a compact and full period of interaction with the world; it is a time of continually constructing, testing, and reconstructing. We might even say that it is educational, though we would be hard pressed to call it schooling.

I introduce the contrast between education and schooling at this point because I believe that the questions which can be raised of the implications of Professor Doll's argument stem from assuming, inadvertently, that we can speak about adaptation within the concept of change without attending to the influence this adaptation has upon the concepts of education and schooling, and thus upon curriculum. An oversimplified portrayal of the Newtonian view of change admits that schooling and education are substantially interchangeable, while a Piagetian or organismic view is bound to distinguish the terms sharply. The mechanistic account, putting it crudely, sees the progression from childhood to adulthood as the acquisition of increasingly complex skills and information, which is learning. So, whether this occurs within or without a formal institutional setting is less important than the basic proposition that it is in all cases a matter of the environment acting on the learner. Piagetian theory sets learning aside and insists that natural develop-

ment to adulthood is primarily a matter of the interactions between the developing person and the environment. While it may not always be easy to say that these interactions are educational, it is certainly the case that when the environment acts on the individual in such fashion that interaction is inhibited or prohibited then this is not educational, though it may occur in school.

Professor Doll's invitation that I follow him along the development of the concept of change from the halls of science to the area of change in youth and the subsequent implications for curriculum is welcome. But his guidance was somewhat incomplete because, as I tried to move further with the argument's consequences, I was unaware that the threshold, curriculum, had also moved, so I tripped. True, I was cautioned that "curriculum is inextricably tied up with change ... in the sense that curriculum is directly influenced by the view of change held."[17] I took this to refer to the contrast between an aggregate model and a systemic one, a contrast which distinguished one method of curriculum construction from another. Yet, I now believe that the entire concept of curriculum has changed, and I don't think I ever fully recovered my balance. The concepts "education," "schooling," and "curriculum" are less than clear, and until some of their features are distinguished, I will remain undecided about the dilemmas of teacher as curriculum-maker or as curriculum-follower and about the conceptual relationship between a teacher's professional autonomy and the Piagetian view of change that Professor Doll advances. His paper has led me to recognize anew a second "essential-tension," that between education and schooling. And although I have not yet begun to map this tension and so to understand it fully, I know "Curriculum and Change," to be an important starting point for the enterprise.

* * *

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* * *

Which conference program lists as speakers one hundred curriculum specialists from Canada, Europe, Africa, Asia, Australia, and the U.S.?

Bergamo.

RESPONSE TO REID AND WANKOWSKI

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To read "The Psychology of Curriculum Theorizing: A Conversation" (*Journal of Curriculum Theorizing*, 4:2) is to eavesdrop. Even when I have eavesdropped on a conversation that I was meant to hear, I am ashamed, for there is a tacit agreement between the speakers and myself that we will not acknowledge that I have heard. We form a complicit triangle. I relieve the speakers of having to deal with each other because now they will speculate about my participation. What did I hear, what did I understand? What will I do, say? Who will I tell? I, having heard, am complicit in this discourse unless I say what everyone knows: I heard you. In this response to Janek Wankowski and William Reid I will start off by saying what everyone knows: this piece is gossip. Then I will briefly present some questions about curriculum discourse as gossip.

Gossip

The word gossip was a word that originally designated a child's godmother or godfather, a person who, because of his or her present and future concern for the child was present at the ceremony of its birth. In Middle English the word appeared as *god-sib,* or *godsybbe.* The word moves through two transformations that bring it to its current status of denoting talk that is trivial, idle and wicked. As those designated as godparents were often friends of the child's parents, the word gossip took on an association of

intimacy. By the sixteenth century we find the word *gossip* referring to a woman's female friends invited to be present at a birth. The news, anecdotes, discourse that the women, the gossips, exchanged while they waited, came to be known as gossip, the talk of women.

As women's talk, gossip gathered to itself the conditions of women's lives. Barred from public forms and public responsibility, it is an alternative discourse system. Retaining the sanction of intimacy, it is the language of relationships requiring trust, bonded in feeling. This chatter was a liturgy for the ceremony of birth; it was a primordial accompaniment to the labor that brings the child into the world. It is the dark discourse of the mystery of birth, of women's lives, uttered only in the absence of men.

The Wankowski-Reid piece giggles and whispers with gossip. As a conversation, it eludes the form of professional discourse. It meanders, repeats itself and excuses itself from the obligation to develop an argument that entails both sense and reference (Ricoeur, 1976). What is the point of this piece is never an issue that these writers engage. Wankowski's belittling and cynical closing metaphors reveal his pleasure in subsuming and denigrating the theories he has described. Is that the point?

This essay substitutes voyeurism for understanding. As readers, Reid and Wankowski rarely reflect on their own associations or motives. Reid presents his response briefly and then asks Wankowski to speculate on administrator's responses. The categories for analysis that Reid introduces in the beginning of the piece serve only as a pretext for what follows, for he cannot get Wankowski to entertain them seriously at any point. Each term – "systemic, radical, existential and deliberative" -- is drawn from its own discourse system, respectively: structuralism, politics, philosophy and psychology. The definitions provided in the footnote draw them into a conceptual order that might be employed to illuminate the curriculum field as a discourse system but that step is never taken.

The approach taken by Reid and Wankowski confuses theoretical texts with Rorschach interpretations. It is oblivious to the genres of theory and discourse that each

writer has chosen, ignoring intersection of the history of the form, the writer and the field. It is oblivious to the ways in which each writer presents a foil for the other, the ways in which each one's voice makes it possible for the other to be heard. Most distressing is Wankowski's labelling of Apple as absolutist and his insinuation that his project is totalitarian. Expressing a desire to dominate is not what constitutes totalitarianism. Apple observes the rules of theoretical discourse. He may sketch out a millinerian vision, but his colleagues, save for a few indentured graduate students, are not compelled to subscribe to it. His arguments provoke resistance and negation even as they attract advocates. What is totalitarian is Wankowski and Reid's discrediting and coopting of theoretical discourse. Theory, the bridge from what is to what might be, collapses under the weight of psychological determinism. The authors dismiss these theoretical texts by reducing them to therapies, the at times intriguing sublimations of driven, "compulsive" and troubled colleagues. After this patronizing reduction they muse about whether these theorists could talk to each other. Could they talk to each other? They *are* talking to each other. That is what the theoretical discourse of a field is about, and it is not merely a substitute for group therapy. Reid seems to have some inkling of this possibility. He knows and has, in the past, appreciated the field. But it appears that despite his good manners, good intentions, and departing apologies, Reid has come to visit his American friends with a dog who pees on the rug.

So this chatter is as close to knowing the secret lives of our favorite theories as we can get without getting a glimpse of their medicine chests or knowing whether they prefer Chef Boyardee to Buitoni ravioli. And while Wankowski announces his own flexibility and tolerance, he has, it appears, clear rules for gender, appropriate sexuality, for non-conformity as well as a deep suspicion of collective power and social movements.

Is it possible that Wankowski is oblivious to the denigration and objectification of diagnostic discourse? Like our current addiction to "General Hospital" this piece simultaneously fetishizes our colleagues and admits them to the

local ward, asking important questions like "will they play cards together or stare out the window?"

Bill Reid's final disclaimer confesses some discomfort. But not enough. Form is not a pretty package. This piece discredits recent attempts in our field to ground theory in lived experience, to address our own complicity, to organize, under the name curriculum theory, an inquiry that helps us take responsibility for the forms we are and the forms we create for other people's children.

Self disclosure becomes self-knowledge only when it illuminates the complex and intricate relations of subject and objection, self and world. Ricoeur understands the interpretation of texts as requiring a similar relation of sense, the text's own logic, to reference, the horizon of meaning that stimulates the text. When the writer of the text studies (not merely reports) his own experience of that writing, or when a reader analyzes his understanding of and response to a text, their actions refer both to the worlds of the text and to the possible world that both the text and our response to it point to. That is the world of curriculum theory. But Reid and Wandowski withdraw from the world, and fixated by the genetic fallacy, they slide from the texts and from the worlds they depict to a ranking of their writers according to Wankowski's political, social, and sexual preferences. The only place we are left to go is to wonder whether Wanknowski's announced preference for Schwab reveals a hypothalmic ambivalency of the third kind.

When women came together to gossip a baby was born. They ushered in new life. This gossip makes the lively work of our colleagues into dead things. We do need new forms in our work. We do need to bring the private truth, the dark secret, into the forms of our public world, but this shallow psychologistic namecalling just won't do. It provokes shame, and silence. By making its subjects into objects it robs them of response. Let us be friends. Let us sponsor each other's child in the world. Let our gossip bring forth that world.

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THE EROSION OF CHILDHOOD: GOOD NEWS OR BAD NEWS?

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"How can we understand the meaning and experience of a modern childhood?" (p.29) This may be the most important question Suransky puts before us, and for her, with a declaration of standing in a research tradition grounded in phenomenology and hermeneutics, the question "directs us back to the children themselves." (p.29) Instead of a "mechanistic psychologism and an instrumental operationalism," orientations which, she suggests, have undergirded our reflection about children to date, what we need is an exploration of "what seems to matter" in children's lives; a revealing of their "special mysteries." (p.29) For the lives of children, which "puzzle .. the fixed notions of our experts .. are so very far away in time and space from our own." (p.29)

The pursuit of these issues leads Suransky on a threefold course. In the first, the history of the idea of childhood is examined, with an attempt to answer the question, "Is childhood itself a social invention or is it a natural state of being?" (p.3) Following Philippe Aries' thesis that prior to the sixteenth century childhood as a social category did not exist, only to emerge as a bourgeois "privileged age" in

the nineteenth century, Suransky moves to argue that today we live in a condition when the "science of childhood" has come of age. The result has been a clear demarcation between the world of the child and the world of the adult, a historical "progression" from medieval "miniature adultism" which marked a "forgetfulness of childhood" to a contemporary view of the "containment of childhood," a view which has succeeded in "alienating the life project of the child from the child's existential reality." (p.8)

> We now separate children from the world of work; we dichotomize play from work; we deny the significance of the child's contribution to the cultural forms of everyday life. We infantilize children's perceptions and "school" their minds through the domestication of their critical curiosity and consciousness. (p.8)

Along with a critique of the images of childhood in contemporary social science (images which are seen to increase the "effective domestication of childhood" by rendering children as objects of study), prominent feminist writers are also discussed. Shulamith Firestone's utopian "cybernetic socialism," wherein women are freed from the "tyranny of ... reproductive biology" is criticized for not giving full weight to the cultural importance of "primary attachments" between mother and child. (pp. 9,10) Nancy Chodorow's psychoanalytic treatment of the implications of the reproduction of mothering for the sexual division of labour and for family structure, etc., is applauded as "original" and "provocative," but also to be regarded as "failing to locate mothering in the interactional moments between mother and child." (p.4) "It is children, after all, who create mothers, and the voices of children are sadly absent from Chodorow's text." (p. 13)

The essential thrust of part one, then, is a display of how the idea of childhood has been "transformed and reconstituted in successive historical eras" (p.27), culminating in a present condition in which we have "rediscovered childhood, but in so doing, have eroded its every ontology as a life phase." (p.27) Making explicit this ontology is for Suransky the hermeneutic task of "uncovering the everyday life experiences of the child [to] render them visible

to those in power by giving them sensible actuality." (p.28) The explicit starting point for investigating the child's life world is Gadamer's articulation of hermeneutic understanding as a "fusion of horizons." This must involve "not an adult reconstruction of alien events and life-forms, not the methodological alienation of the knower from what is to be known, but rather a mediation between these two horizons." (p.35) It is here that "phenomenology as an appropriate approach .. becomes apparent," because it is through "clear, vivid, faithful [phenomenological] descriptions of experience" that "the praxis of a social phenomenology of childhood lies." (p.37) "Understanding" brought about by such descriptions leads to "change." Research in this way "becomes a praxis upon the world." (p.38) Needless to say, there are some fundamental assumptions here that need clarification, a task we will undertake later.

The real strength of the book is the second part which contains rich description of the world of modern institutional daycare. Suransky describes daycare as a phenomenon which, in its contemporary forms, has become "an ideological battleground, ... a women's issue rather than a child issue," containing not only "many complex problems which are central to the being of the developing child," but also, in a capitalist system, a movement which "pits not only worker against owner but the rising 'class' of women against their own children." (p.47) Free and universally available daycare has become a "simplistic catch phrase [which] needs demystification" through the addressing of important questions, such as "What kind of daycare? Who will fund and control the centres? What about parent participation?" etc. (p.47) These questions are the subject of the book's final section.

The life-world descriptions of five pre-school settings, which form the bulk of the text, are highly perceptive and sensitive, and while stylistically restrained, are remarkable for their power, a power which cannot be duplicated here. With the exception of the portrayal of one institution, the Martin Luther King Childcare Centre, (and why this centre is exceptional is worthy of a separate study), what emerges is a devastating scenario of the subjugation of children,

a subjugation all the more horrible for being cast under the aegis of adult thinking voiced by those in authority as being good, correct, or somehow legitimate. In the Golda Meir Nursery, for example, children are shown to be imprisoned within a "temporal rigidity" (p.61) executed in the name of efficiency and of providing a temporal structure in which children can be made to feel secure. There is snack-time, story-time, free-play time, clean-up time, going-home time, etc., a routinization internalized by the children themselves to the point of becoming a deep part of their own interactional vocabulary, and thus providing norms by which labels of deviance can be easily assigned by both children and teachers alike. In the Busy Bee Montessori Centre, one 'sees' the effects of a conceptual reification of the virtue of work, resulting in two-year-olds displaying a clear movement from "work insularity to work possession to work ownership with the concomitant attitudes of hostile regard and alienation from one's neighbor." (p.85) In virtually all of the institutions except one, conflict (between children themselves and between children and teachers) is regarded as pathological or deviant; something to be avoided or smothered, with the consequence of reducing relationships either to ones of smoldering, suppressed hostility, or to forms of engagement stripped of anything real. From the context of these disturbing descriptions, Suransky concludes with her central thesis that such forms of care surrender children to a condition of genuine "homelessness," a condition which in turn is "sad testimony to the erosion of childhood." (p.187)

Without doubt, this book makes a major contribution to our understanding of daycare. Suransky's vivid portrayals help us to see very clearly those languages and structures of oppression which accrue to children through the implementation of unreflective adult agendas. It is difficult to read her descriptions without being incited to outrage, and many of her observations can be corroborated in child care facilities across the land. A crucial originating question of this book however, and the implications which arise from that question, remain unexamined: "How can we understand the meaning and experience of modern childhood?"

The search for understanding is the heart of the hermeneutic enterprise, and Suransky wishes to declare her study as a form of hermeneutical research within the human sciences. There is not space here to fully discuss such a claim, except to say that Gadamer, for example, has always insisted that hermeneutics is not simply one facet of the human sciences, or an approach, say, that is more 'meaning-centered' than typical quantitative research methods. In *Truth and Method*, Gadamer proposes that "hermeneutics is a universal aspect of philosophy, and not just the methodological basis of the so-called human sciences." (TM, p.433) To grasp this is to proceed very differently from the way Suransky has proceeded.

The essential hermeneutic question of "understanding" (how can we understand children?) involves far more than a search, say, for the structures of the life-world (of children), or even a ferreting out of discrete meanings assigned to childhood by adults in specific situations. Neither, as Gadamer says, is understanding concerned with "understanding historically" (the history of childhood), i.e. history as reconstruction. Rather it has to do with "awakening what is held in common." (TM, p. 350) Hermeneutically we are not concerned with "relationships between judgments which have to be kept free from contradiction" (TM, p.407) (analytical critique of theories of childhood) but rather with "living relationships"; (TM, p. 407) not with a technical virtuosity of 'understanding' everything" (becoming experts about children), but rather with a "genuine experience, i.e. an encounter with something that asserts itself as truth." (TM, p. 455) The central hermeneutic concern cannot be, unilaterally, with "the ontology of childhood as a life phase" (EC, p. 27), nor with research committed to "the children themselves" (EC, p. 50), but rather with what makes it possible for young and old to live together at all, and to go on living in a genuine way.

Could it not be said that a way to more genuine relations with children may indeed involve an erosion of childhood as we have typically understood it, and a forgetting about it as some sort of discretely circumscribed condition? Suransky's assumptions about children are still essentially

rooted in a developmentalism traceable to the great Romantic, Rousseau, and expressed contemporaneously through Piaget, or at least as Piaget has been romanticized by educators. Developmentalism has its place, of course, but any stage theory of childhood leaves silent how it is itself accountable only within an adult language predetermined as the final word. A genuine hermeneutic, on the other hand, points to the openness of all language, adult and child language alike, and to its infinite power as human experience of the world.

Without doubt, the deep tragedy of all our institutions for the young is that those institutions find their mandate in adult determinations from which the voice of children, as serious interlocution, is shut out. And the poverty of such a state of affairs is borne not just by the young, but, perhaps pre-eminently, by those celebrating their maturity, for as Dieter Misgeld suggests, children cannot be, hermeneutically, "independent from establishing for ourselves who we are, as adults, and what we must orient to in order to live our adulthood." Virtually any tradition of child study is sorrowful insofar as it assumes an adulthood that has given up on its own regeneration. It was said long ago that we cannot see unless we become like children ourselves, thereby holding close to our collective bosom what children know pre-reflectively and what as adults we can only know by an act of will: that the world is an open book, shared by all, into which and by which we read ourselves day by day, learning with every timid, teetering step who we are in this awesome universe, sustained only by love and hope.

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THE RESURRECTION OF THE FEMININE MYSTIQUE

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Child care is an enormously labor-intensive task. Men discovered this early, and elected to have nothing to do with it. Child care became, as did most repetitive, labor-intensive space-confining human tasks, "women's work." Though devalued officially, women's work enriched men because child rearing leads to adult children. Adult children become workers. Workers can by their labors enrich their owners. Certainly children who become workers can be expected to support aged parents.

Children were owned, until recently, not by their mothers who bore and raised them but by their fathers who did neither. Because children were so profitable for Dads, Dads (Judeo-Christian ones) as a group conceived (sic) a sexual code that bonds sex to reproduction. Thus, all the following and more became unnatural and/or sinful acts: masturbation, coitus interruptus, homosexuality, anal, oral and belly button intercourse. If women became infirm and eventually died from too early, too late, too many, too difficult pregnancies and deliveries – too bad! A biblical explanation was already in place to assist people to accept the deaths of young women with equanimity. Children as profit, a notion as old as history, and the consequent notion of sex as reproduction constitute the crucible within

which women's containment was forged. Women were effectively denied spatial freedom. How far can you go pregnant, schleping one or perhaps even two nursing children, two toddlers, accompanied by three or more children under ten? Women were also effectively denied temporal freedom. After caring for eight to twelve children, how much free time remained for study, writing, reading and, most importantly, thinking? And perhaps the greatest constraint of all, women were denied control of their own bodies and effectively denied the release and pleasures of sexual expression. The constant sex-reproduction link, the inevitable pain and burden associated with yet another child to bear and rear resulted in female sexual fear and avoidance. Alas, even sexual avoidance was officially denied when women married. Men who had everything to gain from enlarging their families codified and vigorously enforced the concept of male only "conjugal rights," unlimited, *undeniable* sexual access to their wives.

Industrialization has changed much. However, the changes wrought by modernization and industrialization are very recent. Most of the grandmothers of today's women of childbearing age had three or more siblings. The fight to control births was bitter, long and difficult, and it continues today. Till but ten years ago selling contraceptive devices in the states of Connecticut and Massachusetts was illegal. The Catholic Church still forbids the use of birth control devices.

Nonetheless, as children have become less and less of a fiscal gain and more and more of a fiscal loss, the sex reproduction connection has been weakened. Births have been permitted to diminish, and thus women have begun to experience fear-free sexuality. Women's demands for shared child ownership have been achieved, but men continue to maintain their historic resistance to child rearing. Men have made no demands for their fair share of child-care tasks. Indeed, they fight like hell when women offer to change the care of children from an individual to a joint enterprise.

Paradoxically, although children represent a net fiscal loss to their individual respective families, they are still a much-needed societal resource. Most of us confidently expect that when at ninety we call for a cab, a carpenter, or a cop, the person appearing will be younger than we.

And while aged parents are no longer supported by their own children in our society, retired older persons as a group are maintained by the efforts of persons younger than they. Thus, children, while no longer a fiscal asset for their respective families, are fiscal assets to the society as a whole. Yet individual mothers continue to be viewed by many as the persons appropriately responsible for their children's total care. Since it is thought that children flourish best when reared by someone satisfied to assume the responsibility, women have not only been required to raise children as a totally individual task, women have been required to like it. Each and every woman turned mother is required first to accept and then celebrate the opportunity to do twenty-four-hour-a-day, seven-day-a-week child care. Although for centuries women's connection to child rearing has been linked to the total denial of temporal, spatial and erotic freedom, and steeped in pain, suffering, and death, women are still required to like it and prefer it to any and all other activities.

There have always been women, but amazingly few men, who have resisted these male-imposed requirements, and in the past decade and a half the number of female resisters has become legion. More and more women are saying "no" to male-designed motherhood and childhood and "no thanks" to a life that denies them time, access, and place to earn, to learn, to think and to act on behalf of their own needs and the needs of others. This chorus of nay-sayers is scaring a great many people and a great many people are fighting back. Men have always quite correctly calculated that if mothers don't give each child five, six and seven years of twenty-four-hour, seven-day-a-week free care, either fathers will have to assume their fair share of child-rearing responsibilities or real societal resources will have to be diverted from MX missiles, congressional salaries, Presidential perks, etc., to actually pay for this labor. Is it any wonder that massive counter attacks have been launched to push women and children back where they came from? One can easily see why males are so eager to prevent women from moving out into the world, but why are so many women out there fronting for them? The dutiful daugther*

syndrome dies hard because they are a great many rewards for those who conform.

Valerie Polakow Suransky is a dutiful daughter. *The Erosion of Childhood,* her book on day care, is devoted to a detailed description of five early childhood settings and an analysis of the issue of day care and women's need for freedom from total child-rearing responsibilities. The book's strength lies in the five chapters that detail Suransky's observations of the experience of children in each of these settings. Suransky highlights happenings not often perceived by observers: control techniques, conflict management, time and space allocations, individual and group rights and responsibilities, and the transformation of the non-conforming child into the deviant.

It is not necessary to share Suransky's preferences and values to be enlightened by her descriptions. The book's weakness lies in the analysis, comments and prescriptions that precede and follow the descriptions. These chapters are almost stupefyingly reactionary. The enthusiasm with which women's issues are trivialized, the insensitivity to women's history and needs, the sentimental adulation of children, the spotty and biased scholarship, the constant use of a male world view and the anti-feminist construct boggle the mind. Consider first that Suransky uses her two years of detailed observations of early childhood settings to make sweeping condemnations of day care, middle class women and feminists who agitate for day care. Consider next that of the five settings Suransky observed, only two were by known definitions day care centers. The other three were private nursery school settings. Of the two day care centers Suransky observed one was poor to awful, the other by her lights excellent. "I was impressed by the manner in which the children of Martin Luther King Childcare Center were permitted to experience a childhood relatively unfettered by institutional restraints."

What of the three nursery schools?

> The staff rarely behaved punitively to the children. I did not observe a child being punished during the year of observation visits. Teachers relied on the use of rules, reasoned explanations, orders couched in the form

of requests and occasional threats. (Golda Meir Nursery School – part day program)

In summary, my impression upon entering the Montessori preschool classroom was one of amazement that thirty children and four teachers were contained in such orderly fashion within a relatively small area; yet one did not experience the spatial restrictions very readily as the space was geared not to mobility but to sedentary activity. (Busy Bee Montessori Center)

In this way, I believe, the school went overboard, tilting the precarious balance between an authoritarian and a laissez-faire environment. A double standard arose: expectations for adults were very different from those that operated for children. Children were placed in the position of not assuming responsibility for their actions, for they were protected by an overarching ideology that favored their rights "to be" and "to do" which fostered individualized behavior and made it difficult for the children to develop a sense of reciprocity.

Suransky finds one nursery school setting too dull for her taste, one too controlled, and one in which children are given too much leisure. Nowhere does she suggest that these environments are unsafe, unsupervised, unhealthy or even generally unsympathetic toward children. Neither does Suransky report that in these settings the mothers are generally employed outside the home, nor that the children are there for long hours (one toddler program Suransky observed met twice a week); nor is there any suggestion in these settings of parental abandonment or neglect. Suransky's five observation sites do not provide her with data to make the sweepingly critical statements of day care she makes or indeed any data-based statements about day care at all. The incredible statement that women are sacrificing their children's freedom for their own derives in no part from the evidence of her study.

Suransky's distress with the three early childhood sites centers on the generally tight control exercised over children's

aggression and by the clear time space boundaries and the work play demarcations. Both her observations and conclusions of these aspects of nursery schools are valid and valuable, but her interpretation of what she is seeing is misleading. Suransky believes she is seeing children being institutionalized in all settings but the Martin Luther King setting. Only in that setting she believes she is observing the "at homeness" of children.

What she is seeing in the three nursery school settings is the reproduction of the middle class child. Indeed her descriptions of these centers' weaknesses could apply to the continuum of experiences the middle class child suffers at home: too dull, too controlled, too uncontrolled. The Martin Luther King Day Care Center setting is one in which the reproduction of the lower class child is taking place. In contrast, the run-for-profit day care center which serves lower class children, and which Suransky evaluates so negatively, is day care where a middle class model is in place without middle class resources, and the model comes unstuck. In the exact same building under the exact same callous administrator, Suransky describes a nursery school program managed with more resources and with much happier results. Certainly Suransky is to be lauded for having detected what many observers find difficult to discern: some of the real differences which separate class from class and the manner in which these differences are transmitted. Impulse control, inhibition of aggression, the dichotomizing of work and play in a larger system of time/space compartmentalization are all the characteristics of the middle class mentality and are typically inculcated in middle class children early. That this same middle class child would be "freer" at home, the implicit assumption underlying the whole book, is neither documented nor discussed. Mothers produce children of the class of the mother's father. That is why countries interested in a new man (sic) always look favorably on group care. The Israelis, the Russians, the Chinese, the Cubans all want, at one point, children different from their parents and, therefore, do not trust mothers to raise them. After one or two generations pass, these same countries produce experts who "see" the value

of individual mother child rearing and the value of getting mothers back in the nursery out of competition with men. The mothers, who themselves are products of the revolution, can now reproduce children acceptable to the regime. When maintaining the status quo is your intent, private enterprise child rearing is the best vehicle for its achievement.

Suransky also presents us with the nuclear family model; Papa an almost absent figure is assumed to be out securing cash for dependent children and wife. For Suransky is A-Mazing [Mary Daley's creation] in her denigration of women who work when they "do not have to." Thus wife-mother is at home crazy about her own child while father husband is out in the world getting enough bucks to keep it all going. This is the Suransky vision: the 1950's revisioned! This then is the vision of a woman who considers herself interested in human freedom!

Women may not only need to work for their own very important reasons, reasons not necessarily requiring Suransky's sanctions, they may need not to be dependent on another for their food, clothing and shelter. They may also need not to mother twenty-four hours a day. While so-called middle-class women are regularly inveighed against in the book, as they frequently are in the writing of left-wing males, women's relation to the class structure is ignored. Unless women do have education and employment their class relationship is through a man; first father, then husband. Considering how tenuous the bonds of marriage are, women's ties both to father and to husband are rather weak and a non-gainfully employed or non-independently wealthy woman is only ceremoniously and temporarily identified as middle class.

Blind to the class implications of what she observes, Suransky is not led to all the really troubling questions early group care raises. What is more or less liberating for children – a setting in which they become like members of the same social class as their fathers, or settings in which they become unlike?

Maria Montessori, the designing foremother of one of the nursery settings which most offended Suransky, was a turn-of-the-century revolutionary thinker who believed

class differences were the result of early childhood experiences and of early childhood experiences only. She developed her nursery education program in a conscious effort to move slum children into middle class behaviors. One might agree or disagree with her revolutionary program, but it is one that has been followed by many revolutionary regimes when they come to power. Her belief: train groups of slum children in the structures of the middle class and you will produce middle class children. Ironically, while no one at the time was interested in transforming slum children to middle class ones, the most rigid, controlling middle class parents became Montesorri's greatest fans. So, for sixty years middle class children from the most rigid homes go to the most rigid nursery school, a school designed to compensate for what Montessori saw as the chaotic, unordered world of poverty. This raises another issue for us. While Suransky favors community control of early childhood education, do we not have to wonder if her own experience does not suggest the problems inherent in this design? Parents tend to support community settings for their children which tend to repeat the home settings. Yes, children are then "at home" there but they also suffer a double dose of the inadequacies of their particular family life style.

Because early childhood care is currently divided between profit, non-profit and public, it tends more than any other area of schooling to be the most discriminatory and most biased against children of poverty, unless well funded by societal resources. The feminist cry for universal day care is a cry for some semblance of justice for society's children and an end to quality early childhood education based either on family income and access or the vagaries of political fashion. The positing of mother at home as mothering at its best, places another burden on both the parents and the children of the poor. It allows the middle class critics of non-middle class family life to trace the problems poor children and families have not to an unjust society, but to the absence of the "ma at home, pop out in the world" model. Not only are class implications in early school structures ignored by Suransky, she enthusiastically supports the free enterprise, individualistic American approach to

child rearing that has caused such misery to the children of the poor. Each child must have someone who is "crazy about" her/him, Suransky tells us. That ethic is the code for "I'll be crazy about my child and you be crazy about yours. I shall do everything I can for the good of my child and you do the same. If it should happen that I have more money, more time, more access to sunlight, food, shelter, etc., too bad for you and too bad for your child."

Suransky quotes much about the issue of attachment and non-attachment and the questionable studies of infants' deprivation and damage explained by questionable attachment-non-attachment theory. Suransky then acknowledges that these studies are a poor lens through which to explore the issue of day care and concludes by warning day care partisans that there may indeed be something in this body of research to worry about after all. While Suransky generally decries the impact social scientists have made on our lives and the lives of our children, she does not hesitate to quote the highly controversial studies of Bowlby and Spitz when they denigrate all care other than mother care. Not one of the many positive reports of the effects of group care on children's development is presented. A vague reference is made to Kagan's work, but the positive findings for care other than mother care are not reported. That schooling is a negative experience for children is another assumption in the Suransky argument that one accepts at one's peril. Family control of children is not synonymous with freedom. This is so particularly for females who are often under house arrest from the time they can walk till they achieve widowhood.

Another A-Mazing omission is the absence of any reference to Carol Gilligan's work. Suransky in her sweepingly negative review of all social scientists writes sneeringly of Kohlberg as having written the last word on moral development. Kohlberg is more famous for having the next-to-the-last word on moral development since Carol Gilligan's work has emerged. The work, summarized in a book called *In A Different Voice,* analyzes moral and other developmental issues from the female point of view and points us to an entirely new view of morality and responsibility, attachment and independence.

Perhaps the most distressing aspect of *The Erosion of Childhood* is the long-term consequence of the ethic expressed by it. This ethic jeopardizes women's education and jobs. It conducts the chorus of voices returning women and children to their rightful place at home. Of course, while women are there, they may as well do a little cooking, cleaning and mending. Then it organizes the exclusion of women from graduate and professional institutions as well as from important jobs. If women must leave to bear and rear children, why give them much desired academic and occupational spaces? Indeed, the late Selma Fraiberg, frequently quoted by Suransky, a big back-to-the-house-for-mother expert, in her most famous book *The Magic Years*, writes of how important it is for girls not to develop male goals. Fraiberg always understood the connection between the little girl raised for motherhood and the corresponding loss of opportunities in the world. Fraiberg and Suransky, both professionals, evince no embarrassment when they threaten "middle-class" women like themselves that unless mothers live severely restricted lives, they risk severely damaging their children. Suransky also offers up to the reader a glimpse of her own working style and attitude toward work. Crediting her two parents, but not her husband, with long hours of baby sitting and crises management (let us hope because his equal participation goes without saying), Suransky thanks her children for interrupting her work, and thus reminding her of the all important need to be always available to them. Although Suransky displays enormous displeasure at adults who interfere with children's work and projects, she sees no contradiction in presenting herself to her children as always interruptable.

Suransky, like Fraiberg, considers herself a child advocate, but is she? The vision of motherhood she sets before us is a fine display of "dutiful daughterhood" but a very unfortunate model of adult womanhood to set before sons and a positively disabling model to set before daugthers. It is not uncommon for traditional child advocates to advocate policies and practices that keep our oppressing system of child rearing in place, a system which operates solely to keep available to white middle-class male children the privileges