

https://dspace.org/

The problem of content in the theory of formal operations: Piaget and Vygotskii in the South African context

Moll, Ian

1984
https://hdl.handle.net/10539/32991

Downloaded from a DSpace repository. https://dspace.org/

THE PROBLEM OF CONTENT IN THE THEORY OF FORMAL OPERATIONS: PIAGET AND VYGOTSKII IN THE SOUTH AFRICAN CONTEXT

Ian Charles Moll

A Dissertation submitted to the Faculty of Arts
University of the Witwatersrand, Johannesburg
for the Degree of Master of Arts in Psychology.

Johannesburg 1984.

NK

ABSTRACT

This thesis explores the extent to which Piaget falsely ignores the socio-economic contents of cognition in his account of formal operational thought. His biological conception of the origins of knowledge leads him to emphasise the structures of cognition, but Vygotskii's dialectical materialist psychology challenges this. It denies Piaget's separation of content from structure, and accuses him of losing sight of the social construction of cognition. The thesis attempts to clarify the resultant dispute (drawing particularly on Buck-Morss' charge that Piaget has a socio-economic bias), and goes on to examine a concrete instance of the problem in the attainment of formal operations across different South African communities. Piaget tasks showed that rural children exhibit significantly less formal operational ability than their urban peers, and that within the latter group, township children have less abstract cognitive ability than their middle-class counterparts. Interviews showed that these tendencies correspond in each case to more emphasis on concrete activities, and less on abstract activities, in the everyday lifestyle of the former grouping. But this is in itself not enough to demonstrate a weakness in Piaget's theory. On a more abstract level, the final part of the thesis argues that the epistemology of genetic epistemology is inadequate because it leaves the very social nature of knowledge out of the picture. Taken together with concrete cross-cultural differences, this establishes a serious problem of content - a social "blindness" - in Piaget's theory of formal operations.

DECLARATION

I declare that this dissertation is my own, unaided work. It is being submitted for the Degree of Master of Arts in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.



I.C. Moll

28th day of March, 1984.

DEDICATION

To the farm school and bantustan
children with whom I worked
during the course of this research.
May the social foundations of
formal operational thought become
theirs during their lifetimes.

And to Jean Piaget, who died
during the formative stages of
this thesis. He too would
have wanted it so.

CONTENTS

PAGE

PREFACE ..... v.

Introduction

THE PROBLEM OF CONTENT IN GENETIC EPISTEMOLOGY ..... 1.

Chapter

1. PIAGET'S THEORY: THE CHILD AS ORGANISM ..... 15.
2. VYGOTSKII'S THEORY: THE CHILD AS SOCIAL RELATIONS ..... 38.
3. VYGOTSKII VERSUS PIAGET ..... 59.
4. FROM FARM SCHOOL TO PRIVATE SCHOOL ..... 76.
5. CONCLUSIONS ..... 107.

FOOTNOTES ..... 120.

REFERENCES ..... 125.

APPENDICES ..... 132.

PREFACE

The origins of this thesis lie in a developing conviction on my part that the proper locus of explanation in psychology is psychogenesis. To explain a psychological phenomenon means to trace its formation, and the arguments I develop here represent my first few tentative steps in coming to grips with the implications of that conviction.

It is a conviction that has everything to do with the impact of Piaget's work on my thinking. Ever since I first picked up Six Psychological Studies in 1977, it has been clear that structuralism, in its many forms, represents a dynamic alternative to the moribund and crisis-ridden paradigm of mainstream psychology, positivism. Structuralism demands that psychology explain the structural realities which constitute its object of analysis, namely the complex articulation of the structures of human consciousness and psyche with the structures of biology, of knowledge, and of society. No longer is it possible to formulate a series of pseudo-scientific "general laws" which link variables to one another, and to hope that we can pass these off as explanations of psychological life.

Piaget's central insight that there are common mechanisms in the intellectual constructions of children and in the construction of knowledge throughout human history, no matter whether correct or incorrect in the ultimate theoretical moves it makes, places psychology for once and for all in the emerging "interdisciplinary" challenge to the old Anglo-Saxon university tradition: a psychology

department on the second floor, a sociology department on the third floor, a philosophy department up near the great hall, and never a serious exchange of ideas between them. Piaget's dialectics, and indeed all shades of the dialectic within which meaningful debate about Piaget must take place, means that psychological questions cannot demand the easy, unidimensional answers that so many of its practitioners have insisted on in the past. I hope that I do justice to Piaget's lessons in the following pages.

If I do so, it will be in no small part due to the support and challenges I have received from friends and colleagues. My supervisor, Di Shmukler, prodded the flames at the right moments - I thank her for what she has done. Tony Fluxman and Wally Morrow, in their opposing ways, kindled a number of the fires which burn throughout the thesis, and also helped me to see through the smoke at crucial points. It is to the two of them, more than to anyone else, that I owe the fact that this thesis is only the beginning of an ongoing attempt to make sense of cognitive development. Needless to say, the errors which creep in are mine.

Thanks are also due to the following: Thuli Ndaba and Moenyane Motsoela, who did most of the interviewing and also showed remarkable insights in helping to sort through the mass of information that came from the children; to Mr. Thobejane, Mr. Wilkinson and Ms Masekela, the principals of Temba Primary, St. John's Preparatory and Mmatlhame Higher Primary respectively; to Mr. Mantswe, circuit inspector for the Temba primary schools circuit; and finally to Mrs. Duncan who typed the final manuscript.

THE PROBLEM OF CONTENT IN THE THEORY OF FORMAL OPERATIONS: PIAGET AND VYGOTSKII IN THE SOUTH AFRICAN CONTEXT

I C Moll

On a more personal level I owe a lot to the support and assistance I have received from my parents, especially my mother, and also to the tolerance of various housemates over the years. Special thanks must go to Joanne: she read my thesis, and I read her thesis, and somehow we both got there in the end.

Finally, I would like to acknowledge the financial assistance received from the University of the Witwatersrand and the Human Sciences Research Council.

Ian Moll

March 1984

INTRODUCTION

THE PROBLEM OF CONTENT IN GENETIC EPISTEMOLOGY

Jean Piaget's theory of cognitive development has become so influential within the domain of developmental psychology that both the epistemological question as to how knowledge is possible, and the developmental question as to how knowledge comes to be, are almost automatically dealt with in the terms and concepts of genetic epistemology. However, it is well known that all serious psychological thought, no matter what its hue, stems, whether more or less explicitly, from particular theoretical foundations, and it must periodically be called upon to justify those foundations.

This thesis takes certain features of genetic epistemology to task, and in so doing poses particular theoretical and conceptual problems for Piaget's contribution which, I shall argue, his theory can only deal with inadequately. In this sense the thesis is a work of theory. Its approach is abstract and theoretical and it is concerned to determine the theoretical status and validity of certain specific concepts within genetic epistemology. Even the concrete analysis of the cognitive development of children which I undertake here has as its aim theoretical clarification: the problems I investigate cannot be settled on the empirical level.

The roots of this investigation - the "itch" which this work attempts to "scratch"[1] - lie in the alternative conception of the growth of knowledge in children which Vygotskii represents vis-a-vis the work of Piaget and his followers. My concern here is to tackle the

implications and the adequacy of Piaget's "necessitarian" account of cognitive development. I hope to develop some arguments that demonstrate that certain features of Piaget's discourse - as they manifest themselves in his "theory of formal operations" - present particular practical and conceptual problems for an adequate understanding of the development of children in the current South African context.

But before I attempt an initial outline of what these problems are, a brief formal account of the way in which formal operational thought develops in children is necessary. As is well known, Piaget postulates four main stages or periods in the development of cognitive operations, and I shall examine each in turn.

The first stage Piaget calls the period of sensorimotor intelligence, which takes place before the advent of language in the period from birth to the age of two years. Here, the child can only perform motor actions, without real cognitive activity. Piaget talks of a "type of intelligence resulting in a certain number of performances" (1981a, p. 200), but which is not operational in character since the child's actions have not been operationalised in thought.

At the end of the sensorimotor stage the "symbolic function" appears: the child is now able to imitate simple activities which were previously only directly accessible to her as sensory and motor actions, and to internalise these in "symbolic" mental images. Importantly, the "symbolic function" makes the acquisition of language possible for the first time. All of this adds up to the onset of a new stage - that of preoperational thought - which lasts from about two

to seven years of age. During this period the child develops from what Piaget calls "preconceptual thinking", in which she learns on a conceptual level some of the things she has already mastered on the sensorimotor level, to "intuitive thinking", which is characterised by a rudimentary logic still dominated by immediate perceptions and not yet able to exhibit the essential characteristics of cognitive operations:

> At this stage ... the child cannot perform operations in the way that I define this term. In my terminology 'operations' are internalised actions which are reversible; that is, they can be performed in opposite directions.
> (Piaget, 1981a, p. 200, my emphasis)

So the essential feature of preoperational intelligence is a tendency to centre on only one aspect of a situation and ignore others, which means that a preoperational child cannot go back to the original starting point of any cognitive problem.

From about seven to eleven years of age, the period of concrete operational thought is realised. For the first time, the child's thought is characterised by proper cognitive operations, although they are carried out only with respect to the material reality of experience - hence "concrete" operations, used directly on objects in order to manipulate those objects.

At roughly eleven or twelve years, the fourth major stage begins, characterised by formal operational thought. With it comes the ability to engage in abstract, hypothetico-deductive reasoning (Piaget finds a model for formal operational logic in the propositional logic associated with calculus).

The substantive picture of the cognitive development of children which emerges from Piaget's theory, then, is the following:

0 - 2 years:	Sensorimotor Intelligence.
2 - 7 years:	Preoperational Intelligence.
7 - 11 years:	Concrete Operations.
11 years onwards:	Formal Operations.

Importantly, this account of development rests on the notion that there is a universal and necessary sequence of cognitive development in children which is ultimately sourced in biological maturation, and which reaches its pinnacle (at least for the time being[2]) in the emergence of abstract, propositional logical operations at some point in every child's early teenage years. The genetic epistemological foundation upon which he develops his ideas leads Piaget to postulate an invariant series of cognitive structures which characterise the knowledge of children at successive developmental stages. These stages represent qualitative increases in the logico-mathematical thinking abilities of children, and culminates in what Piaget terms formal operational thought.

This leads me to what I consider to be the importance of an investigation of Piaget's theory of formal operations. In this theory, formal operations are the final stage of a fixed developmental sequence, and as such can be said to represent the raison d'etre for cognitive development as a whole. Consequently, questions about the theoretical status of "formal operations" must inevitably imply questions about the legitimacy of the whole of genetic epistemology. Likewise, to accept genetic epistemology is, in principle, to accept the theory of formal operations as an explanation of the qualitative peak of all human cognition. Any investigation of the

latter is, in other words, a particularly appropriate starting point for a critical, overall understanding of Piaget and his work. Having said that, let me go on to situate this particular investigation of the theory of formal operations, and the problems it will try to resolve.

Piaget has always stressed that he analyses the structures of intellect. In a paper delivered a short while before his death, for example, he says, somewhat humbly:

> What we have tried to do in the past, and what we are still trying to do, is to describe the characteristics of the stages [of development] in terms of general overall structures which become integrated. (1981a, p. 39)

He goes on to emphasise that it is not sufficient to describe stages of cognitive development in terms of their dominant characteristics, as Freud's stages can be in the realm of emotional development. For Piaget, such explanation in terms of the primacy of content "would always be somewhat arbitrary as to exactly what is dominant and what is not" (1981a, p. 39), and is inadequate. The growth of knowledge in children is essentially an internal biological and structural process, independent of cognitive contents, and can only be explained as such:

> Whether we study children in Geneva, Paris, New York, or Moscow ... everywhere we observe a certain social conduct of exchange ... which takes effect by their very functioning, independent of the contents of educative transmissions. (Piaget, 1977, p. 50, my emphasis)

So the knowledge within which a child operates at any point is a consequence of the functioning of an available cognitive structure, and the logical forms and possibilities which it makes possible.

The "very functioning" of children is enough to explain cognitive development.

Now the important point here is that Piaget separates the form and the content of human cognition from one another. Knowledge, in his view, is constructed within and by structures internal to the individual, and one does not need to look to social content to explain its origins.

Vygotskii, on the other hand, informed by the scientific tradition of historical materialism, emphasises that one cannot talk of the structures of cognition independently of their location in the socio-historical processes of human life. It might well have been him who argued, in criticism of Piaget, that "the form of cognition is itself social content" (Buck-Morss, 1975, p. 37). For example, the recurring argument in Mind in Society (1978) is that cognitive development is facilitated by the internalization of a specific cultural and social history. According to Vygotskii, this involves the transformation of nature (the organic and genetic potentials of the child) by means of various cultural mediators, or tools, notably language (see 1978, ch. 1). Thus, the form and content of cognition are seen to constitute a unified totality.

Now the dispute which emerges here - Piaget's emphasis on cognitive structures which for him are independent of the contents of cognition, as opposed to Vygotskii's emphasis on cognitive contents which are themselves the structures of the intellect - demarcates the area of theoretical concern of this thesis.

Piaget's postulation of a stage of formal operational thought has been criticised, either explicitly or implicitly, from a number of different perspectives; the most prevalent criticism questions his underplaying of the importance of content in the development of higher intellectual functions. For example, Bruner (1959) is particularly critical of the biological self-regulating "equilibration" which Piaget sees as the mechanism underlying the transition from concrete to formal operations. For him, social and cultural content provides as much, if not more, of the motivating force:

> the adolescent differs from the child not simply in that he uses a propositional calculus that deals with possibilities rather than merely with actualities, but rather that he is forced to deal with possibility by the nature of the tasks that he undertakes and by the nature of the unfolding and development of his drives and the social connexion required for filling them ... it is no surprise that children of intellectually underprivileged families or of manual workers tend to be less challenged in terms of a sense of possibilities and do not develop ... an abstract gift. (p. 369)

A critique of Piaget by Wason (1977) has shown that complex logical thought can be systematically affected by the content of instruments which are "in stark contrast to the ingenious realistic causal tasks devised by Inhelder and Piaget."(p. 123). Itseems to be some support for an argument that content, or meaning, is much more determinate of the structures of mature cognition than the theory of formal operations seems to permit.

That the logico-mathematical thought emphasised by Piaget is influenced by content seems to be much more apparent in a cross-cultural context. Buck-Morss (1975), by reference to numerous studies carried out in Africa and elsewhere, argues that Piaget's

categories of operational thought are defined by logical categories derived from the capitalist mode of production. For example, she quotes a study by Adjei (1974) which demonstrated that African children excel in the Piaget test for conservation of substance only when their families are involved in the production of pottery, whereas the Western child is able to perform the same tasks almost without exception. Buck-Morss criticises Piaget's theory because it denies a structural identity between mind and society, i.e. "that cognition is itself social content " (p. 37). Similar studies in Southern Africa by Dasen (1972), Murray (1961) and Price-Williams (1961) have shown, on Piaget's model, a retardation in cognitive development, and particularly the attainment of formal operations, in the face of non-technological cultural and environmental conditions.

Murray's (1961) work is particularly interesting for my purposes. Her investigations of cognitive differences between Zulu and white children in Natal have shown a significant consistency with which the performance of Zulu children is below that of white children in attaining both formal operations and concrete operational thought. And there are literally hundreds of studies which tell a similar story, based on comparisons of American and European children with groups of Canadian-Eskimo children, Arab children in Algeria and Teheran, African children in Uganda, Liberia and Zimbabwe, the children of Mexican peasants and working-class children in the West Indies (to name but a few such studies).[3]

This does not mean to say that Piaget has ignored the problem totally. Indeed, he devotes a chapter of Psychology and Epistemology

(1977, ch. 3) to exploring the "impression ... that in many societies, adult thought does not go beyond the level of 'concrete' operations, and therefore does not reach that of propositional operations" (p. 61). Significantly, Piaget regards evidence of the retardatory impact of culture on the maturation of intellectual structures as a problem which genetic epistemology has not dealt with properly: "if a continuous action of the internal maturation of the organism and of the nervous system alone intervened, the stages would not only be sequential but also linked to relatively constant chronological dates" (p. 48). But he remains loathe to locate the motivation for cognitive growth outside the structures of cognition.

Elsewhere, he confirms the existence of cultural relativity in the rate of cognitive development, while still arguing for the primacy of a universal and necessary sequence of cognitive structures in explaining that development:

> [The critical age in terms of cognitive development] is relative to the society in which one is working. We did our work in Geneva and the ages that I quote are the ages we found there. I know that in certain societies, for instance in Martinique, ... we have found a systematic delay of three or four years. Consequently, the age at which those problems are solved is also relative to the society in question. What is important about these stages is the order of succession.
> (1964b, p. 31, my emphasis)

Now there is a particular problem associated with all of this, and it forms part of the major underlying question of this thesis (the "itch" which I spoke of earlier). Piaget repeatedly acknowledges that his universalist notion of cognitive development is problematic in the face of evidence of cultural developmental lags in some social

structures: often, he ascribes this to the inadequate research using Piagetian tasks in non-Western social systems (see for example Piaget, 1977) and even goes so far as to suggest that "psychobiological factors are far from being the only ones at work " (1977, p. 48). However, he and his followers (and, indeed, most of his major critics on this point) seem to treat it merely as a qualification of his theory, and still stick to the essentially structural stages of genetic epistemology in describing cognitive development.[4]

Nowhere, as far as I am aware, does Piaget rigorously explain exactly how and why this kind of evidence is consistent with his theory. He seems to fall back on the two major presuppositions of genetic epistemology, namely the notion that intellectual activity is essentially biological activity, and the radical dualism between the form and content of cognition, and almost seems to reaffirm them in a prescription as to which way cross-cultural theorising in cognitive developmental psychology should go.

But I think that there is still "a problem of content" in Piaget's work - Flavell (1963) points to it when he comments on the inability of some children, in some cultures, to break out of concrete operational thought: "[the child's] cognitive instruments are ... insufficiently detached and dissociated from the subject matter they bear upon, to permit content-free structuring" (p. 204, my emphasis).

It is apparent that an understanding of the properties of formal operational thought might be more dependent on an explanation which

stressed the determinacy of social content than Piaget would allow. And it must be pointed out that Vygotskii's work on cognitive development would release a very different explanation of the attainment of "formal operations" in children, one which would conceive of the structures of the intellect as internalisations of the unified form and content of social structures. This would be particularly important in examining the discrepancies between Western children and their non-Western counterparts in reaching formal operational thought.

In fact, it brings a different theoretical face to research on cognitive discrepancies between different socio-cultural groups to that provided by genetic epistemology. So for example, Vygotskii found that there were significant differences in the thinking of urban children and those in the isolated peasant communities of Central Asia in the 1930s, such that the latter could not cope cognitively "with the rapid socio-economic restructuring (collectivization) and cultural revolution (liquidation of illiteracy) which occurred at the time" (Luria, 1976b, p. 575). They exhibited all the characteristics of thinking found in children who grow up in poor communities, notably an inability to move beyond concrete, practical forms of thought. Their historical circumstances produced, and indeed necessitated, certain forms of practical activity (labour) and hence corresponding structures in their fundamental psychological processes (the reason, in fact, why abstraction structured the thinking of their urban peers). Similar conclusions have come from a number of studies carried out by Vygotskiians working with children in such places as Mongolia, the mountains of

Uzbekistan, and other remote areas of Asia and Eastern Europe.[5]

To turn now to the two-fold aim of this thesis: there are clearly two levels on which Piaget's explanation of the transition to formal operational thought gives rise to theoretical problems, and I hope the research I present here can go some way towards resolving them. Firstly, there is a problem on an empirical level, which is concerned with whether or not evidence of cross-cultural and cross-class variations in the cognitive development of children can be found in the terms laid down by genetic epistemology. As I have argued, there is considerable evidence to suggest that children in some societies do not attain formal operations as quickly as their Western counterparts. But it is necessary that I should investigate the issue here too, if only to provide a concrete starting point for the theoretical endeavour in which I am engaged. Consequently, the first aim of my research is a comparative examination of the attainment of formal operational thought in groups of differing culture and class affiliation in South Africa.

Secondly, and much more fundamentally, there is a problem of theoretical legitimacy, which is a problem about whether or not the theory of formal operations, in its full Piagetian formulation, really is adequate to explain cognitive development. I have suggested that genetic epistemology perhaps takes insufficient account of the role that the historical and social contents of a child's life play in the construction of her cognition, and I have also suggested that Vygotskiian psychology presents Piaget with this kind of challenge. It would be useful to glance back to the dispute between

the two positions which I touched on earlier. There should be a sense by now that the two traditions are embedded in different epistemological and ontological camps, and that this difference determines the way in which they account for the acquisition of knowledge in children in regard to the structures and contents of cognition. Briefly, the two positions may be stated as follows (and I say this only by way of introduction):

i) Piaget's position is that the basis of knowledge is to be found in biology, thus other people exist for the individual simply as part of the individual's environment, as objects, not as co-constituters of knowledge. Knowledge, in other words, is constituted within and by structures internal to the individual. Thus, genetic epistemology amounts to a theory of the biological adaptation and evolution of cognition.

ii) Vygotskii's position is that the basis of knowledge is to be found in the social world. The child is never a "solitary centre of consciousness", consciousness is necessarily a function of the social order. Thus, for Vygotskii, social relations are constitutive of knowledge and are transferred within the individual to become the contents of cognition and the forms of its structure. Thus, Vygotskii's dialectical psychology amounts to a theory of the historical determination and social construction of cognition.

Now the second aim of my research is to attempt to engage this dispute between Piaget and Vygotskii in order to try to resolve what I have called the problem of content in the theory of formal operations.

The argument of this thesis proceeds as follows: in chapter one, I provide a selective outline of the parts of Piaget's theory which show it to be a theory of biological evolution, and which give it its peculiar character in accounting for mature human cognition. The following chapter, chapter two, tries to develop an account of Vygotskii's work as an alternative conception of the development of knowledge in children to that provided by Piaget. Chapter three tackles the dispute between these two "grand theories", and in particular uses work done by Susan Buck-Morss in order to develop a rigorous definition of the nature of the research problem at hand. Chapter four details this research, carried out in various South African communities, and spells out what its findings and implications are for my developing argument. Finally, chapter five discusses the implications of my arguments for an ongoing understanding of the development of cognitive operations in children in the South African context.

CHAPTER ONE

PIAGET'S THEORY: THE CHILD AS ORGANISM

> My theory of cognitive development, which is particularly concerned with the development of cognitive functions, is impossible to understand if one does not begin by analysing in detail the biological presuppositions from which it stems and the epistemological consequences in which it ends.
> Jean Piaget (1970a, p. 703)

In this chapter, I want to take up the argument I put earlier that, for Piaget, the basis of the development of knowledge in a child is to be found in biology. I shall start with an attempt to provide an account of genetic epistemology which highlights those features which make it, above all else, a theory of biological adaptation. From there, I move on to examine the context and origins of Piaget's thinking in order to establish what kind of tradition it is within which Piaget's work is embedded. Finally, the chapter makes brief points on Piaget's dualism and on his method, in order to open up the problematic within which my research takes place.

The notion of biological activity is central to Piaget's account of the unfolding of the structures of knowledge in a child. In The Origin of Intelligence in the Child, he argues thus:

> Intelligence is a particular instance of biological adaptation ... The organism adapts itself by materially constructing new forms to fit into those of the environment ... intelligence is a particular case of organic activity.
> (1953, p. 4)

So Piaget views the cognitive development of a child as the self-regulatory activity of a complex biological system. Genetic epistemology postulates more than just an analogy between biological and cognitive development - it in fact wants to say that cognitive development is biological development. NO - see essay that Piaget does not reduce cognition to biology

For Piaget, therefore, the object of analysis is an organism, and he is concerned to explain the nature, origins and development of the biological systems which give life to that organism. Piaget emphasises that, like all biological systems, the cognitive system in a newborn human infant is characterised by particular hereditarily-transmitted physical structures, with particular functions, which allow a certain level of intellectual operation, and which become transformed to more complex structures through development. So his analysis is one of the structural and functional aspects of cognition.

To take the functional aspect first. Piaget postulates that all species inherit two basic functions, which he regards as being invariant across the life-span of a particular organism, organization and adaptation:

> From the biological point of view, organization is inseperable from adaptation: They are two complementary processes of a single mechanism, the first being the internal aspect of the cycle of which adaptation constitutes the external aspect. (1953, p. 7)

And he regards these complementary functions as the basis of cognition:

> With regard to intelligence, in its reflective as well as its practical form, this dual phenomenon of functional totality and

> interdependence between organization and adaptation is again found. (1953, p. 7)

We can see then that Piaget's origins in biological theory lead him to view adaptation and organization as the functional invariants of any organism, and to extend this understanding to an account of the acquisition of knowledge.

Let me explore the concepts in order to further strengthen this point. By "organization", Piaget means that there is a tendency for all species, by virtue of possessing already adapted characteristics, to systematise or organize their physical and psychological processes into coherent systems. For example,

> fish possess a number of structures which allow functioning in the water - for example, gills, a particular circulatory system, and temperature mechanisms. All these structures interact and are co-ordinated into an efficient system ... [as] a result of the organization tendency. (Ginsburg & Opper, 1969, p. 17)

But it is on a psychological level that the notion of organization is crucial to Piaget's explanation of human cognitive development. For instance, it is as a consequence of this functional tendency that the various behavioural structures which characterise a newborn infant - inter alia, the sucking reflex, the grasping reflex and retinal functioning - can combine in a coherent perceptual system:

> There is no doubt that a number of behavioural patterns depend on the first functionings of certain structures or circuits. This is true of the co-ordination of vision and comprehension at four-and-a-half months ... we see that maturation consists essentially of opening

> up new possibilities and thus constitutes a necessary but not sufficient condition for the appearance of certain behaviour patterns.
> (Piaget & Inhelder, 1969, p. 154)

So it seems that Piaget's treatment of the internal aspect of the adaptation cycle clearly establishes his theory as a theory of biological growth and maturation of intelligence in children.

Considering the external aspect of the cycle, the adaptational process itself, a strongly biological account emerges too. As Piaget says, "Adaptation is only organization grappling with the actions of the environment." (1953, p. 12) and this conception lies at the heart of his biological model that conceives of cognitive development as an extension of the adaptational process. His own words emphasise the context in which the major complementary processes of adaptation, assimilation and accommodation, need to be understood:

> The development of knowledge is a spontaneous process of embryogenesis. Embryogenesis concerns the development of the body, but it concerns as well the development of the nervous system and the development of mental functions, ... It is a total developmental process, which we must restitute in its general biological context. (1964a, p. 8)

The "mental functions" mentioned, are, of course, assimilation and accommodation.

These two terms have been defined in various ways, but I find Ruth Beard's definitions particularly concise and helpful (see Beard, 1969, p. ix). She defines assimilation as "the incorporation of new objects and experiences into existing schemas", grasping

quite well the idea that intruding stimulii are transformed to fit into available structures. Accommodation, for Beard, is "the modification of schemas as a result of new experiences," which definition captures the idea that cognitive structures are transformed and elaborated by complex intruding stimulii. Ginsburg and Opper (1969) provide a nice account of the complementary functioning of these adaptational processes, on the physiological level:

> When a person eats something his digestive system reacts to the substances incorporated. In order to deal with the foreign substance, the muscles of the stomach contract ... organs release acids ... [that is] the person's physical structures accommodated to the environmental event ... assimilation is the complementary process by which the individual deals with the environmental event in terms of his current structures. In the case of digestion the acids transform the food into a form which the body can use. (1969, p. 18)

And on the psychological level:

> Suppose an infant of 4 months is presented with a rattle ... a feature of the environment to which he needs to adapt ... to grasp the rattle ... he must accommodate his visual activities to perceive the rattle correctly; then he must reach out and accommodate his movements to the distance between himself and the rattle; in grasping the rattle he must adjust his fingers to its shape; ... Grasping the rattle also involves assimilation ... When he sees the rattle for the first time he tries to deal with the novel object by incorporating it into a habitual pattern of behaviour. (1969, p. 19)

So the biological processes of adaptation, viz., assimilation and accommodation, explain cognitive development for Piaget.

To say something now about the structural aspects of Piaget's account of cognition. The tendency of any human organism to organize its activities and to adapt to its environment produces,

for Piaget, a number of psychological stages which take different forms at different ages. The particular kinds of cognitive activities which any child is capable of at any point constitute a series of cognitive schemata, an example of which would be the "thumb-sucking" schema in a very young infant.[1] These schemata together demonstrate a tendency to cluster into coherent structural totalities, and make up a set of functional activities similar in kind to one another.

The stages of cognitive development which Piaget postulates, and which I outlined earlier, are in effect a series of such psychological structures. Development can be represented, in an elaboration of the stages of cognitive development which I outlined in my introduction, as a continual transition from cognitive structures of lesser complexity to those of greater complexity (see Table 1). As I pointed out in the introduction,

Table 1 : The cognitive structures in Piaget's stage theory of development

AGE	STAGE	STRUCTURE (SCHEMATA)
Birth	Acquired characteristics	sucking, grasping, Moro reflex, etc
0 - 2	Sensorimotor	sucking a thumb, grasping a rattle, etc
2 - 7	Preoperations	intuitive, prelogical thinking
7 - 11	Concrete operations	concrete, here-and-now thinking
11 ⟶	Formal operations	hypothetical, propositional thought

Piaget conceives of the transitions from one stage to another as

taking place in a fixed, necessary sequence, and it is this more than anything that establishes the structural aspect of his theory as an account of the maturation of biological structures.

Consideration of what Boden (1979) calls Piaget's "necessitarian progressivism" will demonstrate this argument. For genetic epistemology, each stage through which a child develops is necessary for the next stage to occur. So it is only when the structures of sensorimotor intelligence elaborate fully - in Piaget's structuralist terms, they achieve closure - that preoperational logic is possible, and development can occur:

> there is only one acceptable psychological explanation: this feeling of necessity comes from the closure or completion of a structure ... As soon as a structure is sufficiently complete for closure to occur, ... then the feeling of necessity manifests itself. I believe that it is this feeling of necessity which constitutes evidence of the existence of the overall structures which characterise our stages. (Piaget, 1981a, p. 203)

So the "necessitarian progressivism" which Boden speaks of is an argument that children pass through the stages of cognitive development in a necessary (fixed) sequence, and that the internal logic of structures compels this development.

That this last notion is firmly biological becomes clear when we consider Piaget's account of the dynamics of development, captured in the notion of equilibration. You will remember that I quoted Piaget towards the beginning of this chapter making the point that intelligence is a particular instance of organic activity. Now this, I think, is the conception which makes his "necessitarian

progressivism" a biological theory. In Morrow's words:

> structures are forms of activity. Living creatures, of course, have material structures (organs, for example) but such living structures are simply the more or less temporary embodiments of a structured and structuring activity. Activity is, as it were, the fundamental reality in Piaget's theory. (1982, p. 156)

So the cognitive development of a child is necessary in the sense that the organism would die if it were to cease. Biological structures in any child compel it into a pattern of life sustaining activity (equilibration), which is not voluntary, but a condition of the very existence of that organism.

Perhaps it would be useful to examine an argument Piaget develops in an article in the edited collection, Carmichael's Manual of Child Psychology . For Piaget (1970a), there are three classical ways of explaining development: (1) by reference to maturation, (2) in terms of experience of the physical environment, and (3) in terms of the action of the social environment. But, says Piaget, (2) and (3) cannot account for the sequential nature of development.

With regard to (2), he points out that experience, whether in its "real or imagined" form, is essential to a person's contact with the outside world. But it is inconceivable outside of its source in action: knowledge derived from experience is not based on the material properties of the objects in view, but on the actions exerted on them, which is a crucial distinction for Piaget. On (3), Piaget says that, despite the stages being accelerated or retarded according to a child's socio-cultural environment, the fact that they mature in the same sequence in any social or cultural

situation shows that the social environment cannot account for everything.

And for Piaget, the first explanation (1) is inadequate by itself. He argues that the propositional logic characteristic of children in the formal operational stage is not a necessary consequence of, nor preformed in, the development of the central nervous system. Rather, it is the result of a series of successive constructions made possible by this initial structure. As Piaget puts it elsewhere (1977b, p. 55), maturation only "opens up new possibilities".

So Piaget (1970a) adds equilibration (self-regulation by a biological system) as the crucial factor of development:

> It is not therefore an exaggeration to say that equilibration is the fundamental factor of development, and that it is even necessary for the co-ordination of the other three factors. (1970a, p. 724)

So it is clear that Piaget's view that children develop through a necessary sequence of cognitive structures relies strongly on his notion of the biological self-regulation of those structures.

But let me cement my argument even further by analysing the notion of equilibrium which Piaget works with. Borrowing from the biologist Waddington, he argues that homeorhesis is the fundamental force which accounts for the closure and transformations of structure:

> what is important for us to take from biology is not the notion of hereditary programming, since it is variable and cannot lead to the kind of necessity we feel. We should take the much more general notion of self-regulating mechanisms ... These are regulations

> in the course of embryological development that Waddington calls homeorhesis. (Piaget, 1981b, p. 216)

For Piaget, it is not enough to regard a biological system as striving for balance, or homeostasis, because that loses sight of the centrality of its adaptation and development. Homeorhesis, on the other hand, implies a self regulatory tendency which is a condition of existence of any biological system, and which strives constantly for an equilibrium at a higher and more complex developmental level.

Elsewhere he echoes this concern with a dynamic, developmental account of biological adaptation, rather than a static conception thereof:

> Certain biologists define adaptation simply as preservation and survival, that is to say, the equilibrium between the organism and the environment. But then the concept loses all interest because it becomes confused with that of life itself. (1953, p. 5)

Therefore, says Piaget, it is essential that we distinguish between the "state" of adaptation and the more adequate notion of a "process" of adaptation, which the idea of equilibration implies.

To pull my argument together: it should be clear now that the structural aspect of Piaget's theory is primarily an attempt to come to grips with the nature and origin of biological stages of development. Piaget and Inhelder say as much:

> [The stage theory] is an extension of the problem embryologists raise when they wonder whether ontogenetic organization

> results from preformation or from epigenesis, and what causal processes are involved. (1969, p. 153)

And it should also be clear that the whole project of genetic epistemology is clearly derived from a series of central notions about the biological activity of a developing child.

A brief aside is necessary here. It has often been said, particularly by people who call themselves "humanistic psychologists", that to emphasise Piaget's biological notions amounts to a "pessimistic view" of human potential. This is, I believe, a complete mistake. It is precisely because of Piaget's emphasis on the fundamentals of biological activity that he is able to offer an account of creativity in children:

> In short, the problem of invention, which in many respects constitutes the central problem of intelligence, does not, in the hypothesis of the schemata, require any special solution because organization which assimilatory activity reveals is essentially construction and so is, in fact, invention from the outset. (1953, p. 459)

And he echoes this elsewhere:

> These few examples clarify why I consider the main problem of genetic epistemology to be the explanation of the construction of novelties in the development of knowledge ... knowledge results from continuous construction. (1970b, p. 77)

So to say that Piaget finds the basis of the development of knowledge in biology is not to deny human potential. It is in fact to concretise it, rather than mystify it, as I think the humanistic psychologists have done.[2]

I have said more than enough now to firmly establish that Piaget's

theory of cognitive development is essentially a theory of the biological adaptation of a child to its environment. I shall go on to examine aspects of the historical location of the theory, which will, I think, help to understand why it is as it is.

There are three kinds of intellectual context in which Piaget's theory can be said to be embedded. Firstly, there is a general biological set of questions, which are basically about the idea that ontogenetic development recapitulates phylogenetic development. Secondly, and in a sense stemming from the first, there is a philosophical tradition which conceives the problem of the development of knowledge as being inseperable from the evolution of human knowledge. Piaget himself is perhaps the best example of a philosopher who holds this position, but he owes a great debt to Bergson in this regard. And finally, there is the epistemological tradition which, following Kant, seeks to reconcile empiricism and rationalism in an interactionist conception of the acquisition of knowledge. I shall deal with each of these traditions in turn.

Piaget believes in a weak version of the thesis that there is broad similarity between the phylogenesis and the ontogenesis of human knowledge.[3] In arguing this, he locates himself firmly within a biological tradition which views the organic development of an organism as in some way similar to the overall evolution of its species through history. I do not need to go into the intricacies of the biological theorising involved here - suffice to give an example: figure A demonstrates what the argument in biology that

ontogeny recapitulates phylogeny is about. The central nervous system of a fish is remarkably similar to that of a three week old human foetus, and the brain of a cat would be remarkably similar to that of a four-month-old foetus. The ontogenetic development of the species (maturation of the individual organism) can be seen to be broadly similar to the phylogenetic, or evolutionary, development of the species.

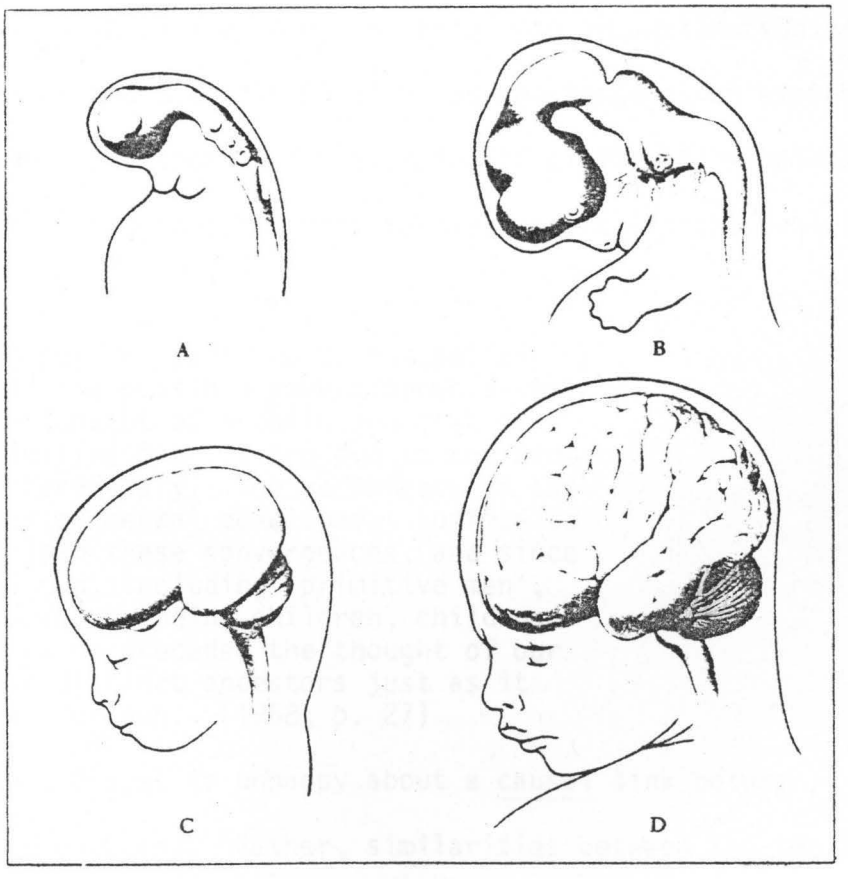


Figure A : Embryonic development of the human brain (Shown are the typical central nervous system A after three weeks of gestation; B after seven weeks; C after four months; and D in a newborn infant. The brains in A and B have strong resemblances to the brains of fish and amphibians. (From Sagan, 1978, p. 198)

As Piaget puts it in arguing for this broad similarity between ontogeny and phylogeny (and I think you can see here why I say that he supports a weak version of the thesis):

> even if ontogenesis is not an exact and detailed recapitulation of phylogenesis, because of differences in speeds and possible short-cuts ... it is nonetheless true that within certain main outlines, the embryo of a cat evinces only the characteristics of a living, even unicellular, creature, than those of an animal, than those of a vertebrate, etc., and finally those of a felid and a cat. (1971a, p. 160)

And Piaget extends this kind of thinking into an explanation of the development and acquisition of human knowledge as an evolutionary phenomenon. He speaks, for example, of similarities between childrens' thinking and that of primitive people (in the evolutionary sense):

> For our own part, we do not believe that the possible resemblances between the thought of a child and that of primitive man ... are due to any kind of hereditary. The permanence of the laws of mental development suffice to explain these convergences, and since all men, including 'primitive men', started by being children, childhood thinking preceded the thought of our most distinct ancestors just as it does our own. (1968, p. 27)

Note here that Piaget is unhappy about a causal link between phylogeny and ontogeny. Rather, similarities between the two lines of development are to be explained in terms of them both being subject to the "laws of mental development", i.e. subject to laws governing the growth of human knowledge.

So broadly speaking, Piaget is embedded in a biological tradition that sees child development as inseperable from the problem of evolution. Working within this tradition, Piaget quite reasonably

borrows a number of models and notions from various biologists to help develop his explanation of children's thinking. In particular, Waddington's The Strategy of the Genes, published in 1957, "was seen by Piaget as a detailed vindication of his own longstanding general approach to biology" (see Boden, 1979, ch. 6), although I do not intend to go into detail here.

To move on now to discuss the philosophical traditions within which Piaget works. Morrow (1982) comments on the paradoxical situation that Piaget's thinking can be considered to relate to both the epistemological dualism of Kant and the epistemological monism of Bergson:[4]

> ... although a [Kantian] interpretation of Piaget's theory makes sense of much of it ... Piaget was being 'pinched' not only by Kantian problems but by others as well ... these other problems ... have their source in Henri Bergson's Creative Evolution. (p. 11)

I shall try to spell out why this can be considered to be the case.

Piaget, in his autobiography, says something very interesting in acknowledgement of his debt to Bergson:

> [Creative Evolution] enabled me to see in biology the explanation of all things and of the mind itself ... It made me consecrate my life to the biological explanation of knowledge. (1952, p. 240)

Although Piaget reports that he became less enchanted with the details of Bergson's theory as he realised that it had no scientific basis, it nonetheless had an important influence on the development of genetic epistemology, in that it was a forerunner of the view that the evolution of human knowledge cannot be understood outside of questions about the origin of knowledge in the individual. For example, in Creative Evolution, Bergson says:

> A theory of life that is not accompanied by a criticism of knowledge is obliged to accept, as they stand, the concepts ... at its disposal .... On the other hand, a theory of knowledge which does not replace the intellect in the general evolution of life will teach us nothing . (1944: p. xxiii)

Clearly, he believes that a theory of knowledge is indistinguishable from a theory of evolution, and this is the philosophical parallel of the biological theory that ontogeny recapitulates phylogeny.

Bergson goes on to postulate a notion of activity which lies behind all human development. For him, evolution is explained by a vital impetus (élan vital) which is the mysterious source and force of life, pushing life to ever higher and more complex forms. This impetus can be seen to be "gushing out unceasingly ... from an immense reservoir of life" (1944, p. 270), and confirms the truth "that we change without ceasing, and that the state itself is nothing but change" (1944, p. 4). The similarities to Piaget's theory are obvious. There is the same concern with a biological motor, which, by virtue of the necessary activity in which it engages, lies at the base of the development of knowledge.

Nevertheless, despite the Bergsonian face to genetic epistemology, Piaget's theory remains an important contribution to the ongoing Kantian resolution of the classical epistemological dispute between empiricism and rationalism. Briefly, this can be conceived of as a dispute about the role of experience in the acquisition of knowledge:

1) The classical empiricist position, of which behaviourism is a contemporary version of in the realm of psychology, argues that all knowledge is acquired from experience;

2) The classical rationalist position, which Chomsky can be interpreted as defending, argues that experience simply "triggers off" knowledge already there in the form of innate ideas (e.g. Chomsky's innate "language acquisition device");

3) The classical Kantian compromise between (1) and (2) argues that experience presupposes knowledge, but knowledge is acquired as a result of experience. Piaget regards himself as a defender of this latter position.

Piaget argues that any adequate theory of the growth of knowledge must explain both the origin (genesis) and the structure of that knowledge. Empiricism he regards as deficient in that it describes development in terms of genesis without structure. There are numerous instances of Piaget attacking classical empiricism, or its powerful technicist offshoot, behaviourism, in these terms. For example, in Insights and Illusions of Philosophy, he argues that a person's construction of knowledge cannot be due to experience alone; it must always involve some kind of structuring, in terms of available schemata, for us to be able to make sense of it. This reality, says Piaget, is something of which "empiricist philosophy has not seen the extent nor grasped the full import" (1971b, p. 54). Elsewhere, in building an attack on behaviourism, he flies his colours well and truly:

> My own personal whipping boy is ... the empiricists in general ... knowledge in my view is a structuration of reality and not just a copy. The development of intelligence is not just a matter of empirical associations, but it is a construction on the part of the subject.

> So throughout all my work, the adversory has been empiricism. (1981c, p. 222)

Moving to a consideration of classical rationalism ("nativism" or "innatism"), Piaget is equally scathing. The rationalists, he says, put forward a structure without genesis, and this leads them to lose sight of the important fact that knowledge is constructed:

> Necessity, instead of being the prior condition for learning, is its outcome. ... all structures are generated. (Piaget, 1971c, p. 62)

So, for example, Piaget is unhappy about Chomsky's hypothesis that the structures of transformational grammar rest on a fixed, innate core containing the most general forms of language:

> It seems to me that this hypothesis is not necessary ... language ... develops at the end of the period of sensorimotor development, with all the numerous stages of construction involved in this form of intelligence. It seems to me that sensorimotor intelligence, once achieved, contains all that is necessary to furnish Chomsky's innate fixed core without having need to appeal to a hereditary structure. (1981b, p. 215, my emphases)

This general scepticism about rationalism, coupled with his rejection of empiricism, leads Piaget to seek an interactionist compromise in the Kantian epistemological mould. As Hamlyn (1971) puts it:

> it is right to see Piaget as an essentially Kantian thinker. Just as Kant's reconciliation between empiricism and rationalism came through the idea that experience is determined by categories which are a function of the human mind, so Piaget's ... comes through the idea that experience develops according to structures which are, likewise, a function of the human mind. (p. 15)

To look back to what I said earlier about the processes of assimilation and accommodation: these notions are clearly interactionist (and Kantian) in their Piagetian formulation. Both experience (intruding stimulii transforms existing structures) and

existing knowledge (stimuli are transformed to fit into available structures) determine the growth of knowledge at any point. In Piaget's terms, genetic epistemology provides an account of structure with genesis.

Now it may be that up to this point I have provided only a potted and not very substantive account of the Kantian nature of Piaget's theory.[5] But it is adequate to the crux of my argument, which I am now in a position to develop: there seem to me to be strong indications that Piaget's Kantianism derives from his biological concerns. In Adaptation and Intelligence, he puts forward an argument about ideas developed in biology by neo-Darwinists on the one hand and behaviourists on the other. Importantly, this debate parallels directly the rationalist-empiricist dispute which Piaget is concerned to reconcile:

> logically, of course, there is no contradiction between them ... Neo-Darwinism is after all only concerned with genotypic hereditary, and behaviourism only with reactions that remain essentially phenotypic, and thus nonhereditary. If participants on both sides were correct in their beliefs, it would amount to saying that the environment plays a purely negative part at the level of the genotype and an essentially positive one at the level of the phenotype. (1980, pp. 78-79)

The point which becomes clear here is that Piaget's epistemological concerns stem from his biological presuppositions, as does his Kantian resolution of the rationalist-empiricist debate. He goes on to argue that there are crucial relationships between the level of the genotype and that of the phenotype, and that this necessitates a synthesis in biological theory between neo-Darwinist trends and behaviourist trends. This refusal to divorce a theory of knowledge from a theory of evolution is, of course, central to genetic epistemology, and it gives rise to Piaget's particular epistemological

commitments.

In fact, the quotation with which I opened this chapter now makes perfect sense. Piaget urges an analysis of the "biological presuppositions from which his theory stems and the epistemological consequences in which it ends" (1970, p. 703, my emphasis). It is biology, and not philosophy, which is his starting point.

To look back now over the three kinds of intellectual context in which I have argued Piaget's theory is embedded: clearly, my argument that Piaget operates primarily on biological terrain is vindicated. The basic questions which worry Piaget are biological questions, and his work as psychologist and as philosopher stems in large degree from these concerns.

Finally in this chapter, I want to raise two of the many vexing questions about Piaget's theory which have confronted me in my research, and which make it clear that Piaget's theory is enormously complex, and not at all easy to understand. The first question has to do with Piaget's emphasis on the structures of the intellect at the expense of content, and the second question is about Piaget's method and its relationship to his notion of science. My treatment of both questions here will be brief and somewhat cryptic - to deal with them adequately would require at least a thesis on each.

We have seen that for Piaget biological activity is a central feature of any living organism, and that it is to this activity that we need to look to explain the development of knowledge in children.

Importantly, the activity is contained within the individual organism, and the genesis of knowledge takes place within structures internal to the organism. This does not mean to say that Piaget wants to deny the importance of social factors in the development of a child, but that he emphasises a concept of activity which is radically non-social. Perhaps a more satisfactory way of stating this is to say that Piaget's theory presupposes the epistemological primacy of biological activity. Social structures, in contrast, are merely "boundary conditions" within which this biological unfolding takes place; knowledge is in no sense constituted socially for Piaget.

Now what this means is that Piaget remains firmly within a Cartesian dualist framework in his account of the genesis and structuring of knowledge. He maintains Descartes' classical distinction between the "inner" and the "outer", or "mind" and "society", and indeed this is the mode in which he sees himself operating as a Kantian thinker. On this basis, Piaget then postulates a dualism between the form, or the structure, of cognition (mind) on the one hand, and the content of cognition (society) on the other. And within this dualism, Piaget goes for the epistemological primacy of the individual (biological activity).

It should be pointed out that the paradox I touched on earlier has a bearing here. There are some senses in which Piaget is monist (i.e. Bergsonian),[6] but I think it is true to say that his philosophy of mind is dualist (i.e. Kantian). Hence, the "problem of content" in Piaget's theory with which this thesis is concerned.

To comment on the question of the method of genetic epistemology: Piaget repeatedly makes the point that his investigations of children, and hence of the growth of knowledge, are scientific, in distinction to philosophical. For example, in Psychology and Epistemology, he argues that there are two criteria which dissociate his science from the field of philosophy:

1) "delimiting the sphere to be studied by refraining by method, by convention, and almost by a kind of gentleman's agreement from discussing all the other related questions" (1977, p. 94), and

2) the accumulation of "experimental facts", or the axiomatic delving into problems, until agreement is reached.

But Piaget is clearly not a dogmatic positivist in the sense that most experimental psychologists are. He does not believe that "facts" are independent of theory, and indeed, his angry attacks on empiricism (logical positivism) which I mentioned earlier are at the same time attacks on this naive positivist notion of science. In fact, Piaget seems to have something like a realist stance on science, which argues that the world consists in an enormous complexity of material structures which it is possible for theory to appropriate to some degree,[7] while at the same time rejecting the idea that facts are simply given to experience. Take for example his comments on the rejection of positivism in physics:

> Measurement must now proceed within the context of a theory of measurement (the most sensitive point of contemporary physics) ... the central problem which these developments in physics raise is ... how the formal ... structures in terms of which physical laws are explained are related to the structures ascribed to the real. (1971c, p. 38, my emphases)

He goes on to clearly reject positivism in the terms that I have sketched above, while at the same time to argue that theory

becomes more rigorous through a process of "steady agreement" with physical reality:

> This harmony between mathematics and physical reality cannot, in positivist fashion, be written off as simply the correspondence of a language with the objects it designates ... rather, it is a correspondence of human operators ... and the unnumerable operators in nature. (1971c, pp. 40-41)

So Piaget is radically anti-positivist, and does not believe that our observations and measurements of the world take place outside of a particular theoretical structure, but at the same he strives for a scientific account of the objects he investigates.

Consequently, it is reasonable to argue that Piaget's method is a kind of abstraction.[8] He grounds his methods in concrete investigations, in rigorous observations of the behaviour of children, but he only gives interpretation to those concrete phenomena within the conceptual framework of genetic epistemology. So his explanation of reality is not simply the neutral interpretation of "facts", but the construction of theoretical claims about the nature of his object in the ongoing attempt to appropriate and understand reality.

This chapter has shown that Piaget's questions about the development of knowledge in children are answered within a biological framework. Epistemological problems are treated as those of how the individual organism can construct its world, and society is merely a set of environmental conditions within which this biological unfolding takes place. But some accounts of cognitive development are seriously at odds with Piaget's views, and I shall go on to examine one such account advanced by the Soviet psychologist, Vygotskii.

CHAPTER TWO

VYGOTSKII'S THEORY: THE CHILD AS SOCIAL RELATIONS

> By changing Marx's well-known proposition we might say that man's psychological nature is a totality of social relations which have been transferred within and have become the functions of the personality and forms of its structure. Lev Vygotskii (quoted in Sutton, 1980, p. 31)

The purpose of this chapter is to provide both an historical and a substantive account of the cognitive developmental theory advanced by Vygotskii and his followers, notably Luria (1976a), in the Soviet Union. As we shall see, the theory provides very real alternatives, on both the epistemological and psychological levels, to that put forward by Piaget. In particular, I want to make sense of my claim in the introduction that, for Vygotskii, the basis of the development of knowledge in the child is to be found in social relations. The chapter is structured as follows: the first part attempts to develop an account of the historical formation of Vygotskii's thinking in 19th Century and subsequent Marxism. Secondly, I say something about Vygotskii's work in post-1917 revolutionary Russia, especially with regard to the academic and political struggles of the time. This then leads to a substantive account of Vygotskii's explanation of the acquisition of knowledge by children. Finally, the chapter deals briefly with the dialectical nature of Vygotskiian psychology and its adherence to the main features of Marx's method.

It is only in the past ten years or so that a sustained concern with

the implications for psychology of dialectical materialism has emerged in western academic circles. But Vygotskii always saw himself as a contributor to the ongoing development of dialectical materialism, and it is to notions of human nature and epistemology developed by Marx himself that we need to look to understand the origins of Vygotskii's contribution to developmental psychology. Marx said very little about psychology as such, but he raised all kinds of very important issues for the theory and practice of psychology "insofar as he was fundamentally concerned with the formation and reformation of man" (Simon, 1971, p. 120).

We must start with a consideration of the distinctiveness of dialectical materialism, and its fundamental importance for an understanding of human thought and action. It is well known that Marx "turned Hegel on his head," and in so doing brought Hegelian dialectics into the service of materialism. Both dialectics and materialism, as Marx inherited them, were perceived by him to have strengths and weaknesses, and he sought to reconcile those strengths, and eliminate the weaknesses, in what has come to be known as dialectical materialism.

To comment briefly on this reconciliation, in Marxist terms: Hegel's strength was that he gave expression to the idea that the world is a complex of constantly changing relations between entities, which can only be understood as a totality in inter-connection with everything else. Consequently, for Hegel, to understand anything "is equivalent to being conscious of it as a concrete unity of opposed determinations" (Hegel, 1968, p. 100), and the constant

transition of human thought and consciousness cannot be conceived of as separate from the processes of life:

> Usually we regard different things as unaffected by each other. Thus we say: I am a human being, and around me are air, water, animals, and all sorts of things. Everything is thus put outside of every other. But the aim of philosophy is to banish indifference and to ascertain the necessity of things. By that means the other is seen to stand over against its other. Thus, for example, inorganic nature is not to be considered merely something else than organic nature, but the necessary antithesis of it. Both are in essential relation to one another; and the one of the two is, only insofar as it excludes the other from it, and thus relates itself thereto. (Hegel, 1968, p. 222)

So Hegel is radically anti-dualist in his conception that human consciousness is necessarily entailed within nature as a whole. But Hegel was an idealist in that he believed that human "Spirit", in the last instance, provokes changes in nature, and it is this weakness which Marx rejected, or more properly, inverted, in his reaffirmation of materialism: "one cannot separate thought from matter which thinks" (Marx, 1977, p. 152). At the same time, Marx was able to overcome the chief defect of classical materialism - its static, mechanistic nature - by fusing it with Hegelian dialectics. As Marx's chief collaborator, Engels, puts it:

> Motion is the mode of existence of matter. Never anywhere has there been matter without motion, nor can there be. (Engels, 1939, p. 68)

And so Marx's materialism developed in its particularly unique form, asserting that human beings exist in a dynamic and primary relationship with nature, and that this relationship is mediated by labour.

Now this account of the epistemological and ontological commitments of Marxism has necessarily been brief,[1] but it is enough to allow me to proceed with my argument about the particular view that Marx has of the social construction of human psychology. Dialectical materialism leads to a particular view of the determinants of human consciousness, captured in Marx's well known maxim:

> The mode of production of material life conditions the social, political and intellectual life process in general. It is not the consciousness of men that determines their being, but, on the contrary, their social being that determines their consciousness. (1978a, p. 4)

Marx's particular insights here present us with the idea that human beings are constructed by a nature which consists in their productive activity, that their consciousness is nothing other than this practical, sensuous activity, and that human development needs to be understood within the totality of these constantly changing relations.

Hence, the notion of an historically-formed human nature, embodied within labour, is an important facet of Marx's theoretical contribution. He states his position on this matter clearly in a short critique of Feuerbach's notion of human essence:

> Feuerbach resolves the religious essence into the human essence. But the human essence is no abstraction inherent in each single individual. In its reality it is the ensemble of the social relations. (1978b, thesis VI)

And in thesis VII he criticises Feuerbach's inability to see that the abstract human person he talks of is herself a social product.

Perhaps it would be useful to examine what it was that Feuerbach

was trying to do. A philosopher of religion, he was concerned to ask the question as to why people make claims about the existence of a god, life after death, etc. And as a materialist follower of Hegel, he answered it by examining their societal position. Religion, he argued, can be viewed as a projection of human inadequacies into the heavens: we separate ourselves from human potential, and then worship it as if it were outside of our being. So Feuerbach viewed theology as an alienated form of anthropology, and a reflection of the alienation of humankind. Importantly, for Feuerbach, in analysing religion:

> The point of departure is the real man of flesh and blood standing on the solid ground earth and breathing in and out all the powers of nature. (Feuerbach, 1957, p. 32)

In other words, our starting-point should not be an abstract idea, but the concrete life of human beings as embodied in their feelings, relationships and activities.

Marx regarded Feuerbach's contribution as a major advance on previous German idealist philosophy, but he found certain limitations in the latter's explanation of religion. For Marx, Feuerbach was mistaken about his point of departure - a careful reading of Feuerbach would show that it was not in fact an essential individual with some kind of inherent nature, but rather an interweaving of social relations which define people for what they are, and within which an individual is embedded. Here, then, is an important contribution to what we might conceive of as an embryonic Marxist developmental psychology.

In building up to an account of Vygotskiian thinking, it would be

illuminating to point to important features of this overall Marxist conception of the social construction of human consciousness. Firstly, it is necessary to stress that Marx conceives of human labour as productive activity. People are not simply the passive and unwitting products of a vast and impersonal social system, but are conscious and creative agents. Notwithstanding debates amongst Marxists about exactly how we should conceive of the problem,[2] it is obvious that Marx was centrally concerned with human agency. In a famous comment, he makes it clear that the formation of people - human learning - embodies the creative powers of any human being:

> The [old] materialist doctrine that men are products of circumstances and upbringing, and that, therefore, changed men are products of other circumstances and changed upbringing, forgets that it is men who change circumstances and that it is essential to educate the educator himself. (1978b, thesis III)

Human learning is very much, on this view, a question of the conscious, purposive appropriation of the social-historical experience of humankind.

And this is echoed in Marx's view of the difference between human beings and animals:

> a bee puts to shame many an architect in the construction of her cells. But what distinguishes the worst architect from the best of bees is this, that the architect raises his structure in imagination before he erects it in reality. (Marx, 1954, p. 174)

So the second point is that human learning is of an entirely different order to that which takes place in animals.[3] An animal learns in a way which is entirely an individual phenomenon, because it can "only learn through adapting its behaviour to external circumstances, on

the basis of its hereditary reflex mechanisms" (Simon, 1971, p. 182). A human child, on the contrary, learns in a specific historical and cultural situation. From birth she learns and develops by becoming part of "a humanised world, surrounded by objects created by human beings, and standing in a definite relationship to other human beings" with whom she learns to communicate (Simon, 1971, p. 182).

This communication, of course, takes place primarily by means of language, and this brings me to my third point. For Marx, language is the means whereby a person is able to appropriate human society, and in so doing to become the bearer of the social relations which define her human qualities, abilities and behavioural characteristics. In the Grundrisse, he puts it as follows:

> [the individual] has language as his own only as a natural member of a human community. Language as the product of a single person is senseless. (Marx, 1953, p. 6)

And he echoes this in an important comment in The German Ideology:

> Language is as old as consciousness, language is practical consciousness that exists also for other men, and for that reason alone it really exists for me personally as well ... Consciousness is, therefore, from the very beginning a social product, and remains so as long as men exist at all. (Marx, 1978c, p. 158)

There is clearly a strong hint in Marx's writings of the basis for a theory of psychology, contained in the suggestion that a child's acquisition of language forms the basis for her acquisition of the complex processes of human cognition.

Now the 19th Century Marxist heritage was strongly reflected in the

intellectual and political milieu in which Vygotskii participated and developed his work. An examination of the writings of such important figures as Lenin, Plekhanov and Trotsky reveals that Marx's conception of the formation and socialization of human beings was very much part of the debates which characterised pre- and post-revolutionary Russian society (see e.g. McLeish, 1975 and Lerner, 1982), although there was by no means common cause amongst the protagonists. So Vygotskii entered into contested academic terrain in the 1920s, and this had an important influence on the emphases in his developmental theory. Although the analysis that I can offer here can only be brief and somewhat tentative (owing to the complexity of the history of the Soviet Union after the October revolution), a few comments on the issues will help to locate Vygotskii's origins.

On a political level, the years 1917 to 1929 marked a struggle in Soviet society "for the right to determine the future of the Russian people, first with arms, then in terms of political power, finally with ideas" (McLeish, 1975, p. 100). 1929, of course, was the year Stalin ascended to power, and with him an ideological doctrine which asserted an extreme economic determinism to be followed in Russian cultural academic life. Lenin had, in 1922, stressed the need to reconstruct intellectual production to ensure its optimum contribution to the building of a socialist state:

> no natural science, no materialism whatever, can hold out in the struggle against the onslaught of bourgeois ideas and the restoration of bourgeois philosophy without a solid philosophic basis. (Lenin, 1922, p. 40)

But Stalin, in the power struggle after Lenin's death, turned this into a crude campaign against any attempts to challenge the primacy of the economic base in determining ideological, political and cultural practices in society.[4] This included opposition, in the name of Marxism, to notions of the importance of a creative human consciousness, and marked Stalinism as a reductionist thrust which ignored the importance of the dialectic in Marxism-Leninism.

Within these overarching political struggles, significant conflicts were playing themselves out in Soviet psychology. Up to 1921, Russian psychology was dominated by views associated with Chelpanov, the director of the Moscow Institute of Experimental Psychology, who drew on European philosophers such as Wundt and the Würzburg school. But Chelpanov was superceded by a new wave of psychologists who, faced with the pressing ideological and political demands of a new society (especially with regard to education), were attempting to build a dialectical materialist psychology based on Lenin's philosophy "which sees mental phenomena as having a material, objective basis in cerebral processes" (Rahmani, 1973, p. 13). Chelpanov was dismissed as an idealist, and figures such as Bekhterev, Kornilov and Blonskii came to prominence. In particular, Kornilov was credited with having swept bourgeois psychology away forever with his book Contemporary Psychology and Marxism, so that by 1923 he had replaced Chelpanov as director of the Moscow institute. Although Kornilov did not achieve complete favour with the Stalinist party hierarchy, his psychology developed along strong reductionist and economistic lines. It was as a rival to Kornilov's work that Vygotskii's "cultural-historical" school (and, interestingly, Pavlov's psychology)

emerged after about 1925.

What this meant is that Vygotskii's thinking was forged in the context of his attempts to reassert the importance of the dialectic in psychological theorising. He placed great emphasis on the cultural and social formation of the human psyche, but never lost sight of the importance of human beings as self-transforming agents, and in this sense was a properly dialectical materialist thinker. But Vygotskii had lost the favour of the official party by 1929, and indeed, his work was suppressed at the height of Stalinism between 1936 and 1956.

Armed now with an understanding of the theoretical and political origins of Vygotskii's work, I can go on to provide an account of his theory of the acquisition of knowledge in children.

Vygotskii takes a lead from Marx in insisting that there is a distinction between the learning and thinking of humans on the one hand, and the learning and thinking of all other species on the other. For example, in Thought and Language, he insists that, despite the fact that chimpanzees "display an intellect somewhat like man's in certain respects (the embryonic use of tools) and a language somewhat like man's in totally different respects (the phonetic aspect of their speech, its release function, the beginnings of a social function)" (1962, p. 41), the close social correspondence between thought and language characteristic of human beings is absent in all animals. So the cognitive development of humans is unique in that it takes place along two separate lines:

1) the biological evolution which over the course of millions of years resulted in the emergence of homo sapiens; and 2) the historical development that has transformed primitive man into modern cultured man, with no corresponding structural or biological change in his brain (see Sutton, 1980, p. 29). The distinction between the two is crucial to Vygotskii's thinking: he recognises that aspects of cognitive development are naturally formed in the sense that they depend on the maturation of the organism (1 above), but he asserts the crucial determining significance of socio-historically formed experience in the mastering of "cultural methods of behaviour" (Vygotskii, 1929, p. 415). One can clearly see the Marxian dialectic at work in Vygotskii's thinking:

> Usually the two lines of psychological development ... merge into each other in such a way that it is difficult to distinguish them and follow the course of each of them separately ... Culture, generally speaking, ... transforms nature to suit the ends of man. This same transformation occurs in the cultural development of man. (1929, pp. 417-418)

And his dialectical materialism led him to go beyond the organism to search for the roots of complex cognitive processes in the historically formed environment.

This "historically formed environment" consists of the material cultural processes into which a child is born, and can be discovered

> in the communication of the child with adults, in the objective relations among objects, tools and language which have been laid down in the course of social history. (Luria, 1976b, p. 567)

Vygotskiian psychology clearly operates within the Marxist conception of the relationship between language and knowledge which I outlined earlier. It might be said that he has a materialist conception of

the history of knowledge, in that he views it as part of ongoing practical human activity, or labour. Knowledge consists in the forms of consciousness by means of which people transform the material world (just as in the economic sphere, tools and implements enable the physical modification of nature), and it is enshrined in language:

> a generalised reflection of reality
> is the basic characteristic of words ...
> Thought and language, which reflect reality
> in a way different fromthat of perception,
> are the key to the nature of human
> consciousness. Words play a central part
> not only in the development of thought but
> in the historical growth of consciousness
> as a whole. A word is a microcosm of human
> consciousness. (Vygotskii, 1962, p. 153.

So language is something like a set of (mental) tools whereby children enter into, and become part of, social relations. As one commentator puts it, for Vygotskii "life reveals itself in consciousness and language is man's real consciousness" (Langer, 1969, p. 79): language is entailed within practical human activity.

Now this leads me to the structural aspect of Vygotskiian psychology. Vygotskii conceives the nature and origin of a child's cognitive structures in a way which owes much to dialectical materialism. In Thought and Language he argues that a child acquires cognitive structures by becoming a participant in the social relations within which knowledge subsists, that is, by entering into social structures. His unique insight is that the relationships between a developing child's mental functions are originally relations between real people. So, to glance back to the quotation at the outset of this chapter, it is clear that Vygotskii has borrowed on one of Marx's insights (thesis VI on Feuerbach) to develop a complex account of the social formation of cognitive structures in children.

This structural unity between the psychological and social formations is reflected in Vygotskii's (1962) explanation of the relationship between thought and language. He emphasises that thoughts are essentially the establishment of connections between things, which are acquired through language and hence reflect relationships between things in the world. As he puts it, "thought is not merely expressed in words; it comes into existence through them" (1962, p. 125). So cognition and society are understood as a structural totality, and in this way Vygotskii works within the anti-dualist stance of dialectics. This is again reflected in his comments on the structural processes of memory:

> If a child ... turns to the aid of external memorising means, the whole structure of his processes will be determined by the character of the means which he has selected. Memorising on different systems of signs will be different in its structure. ... a cultural method ... determines the whole composition of the operation. (1929, p. 421)

So cognitive structure is social structure for Vygotskii: the two are inseparably contained within practical human consciousness.

Indeed, Vygotskii cannot conceive of the content and structure of cognition independently of one another. For him, to acquire cognitive structures is to acquire psychological significances, or knowledge of the functions of words and their use in social intercourse:

> ... to study the significance of a particular word, one needs to study the system of processes which in real life is called forth by the use of the word which is mediating the objective content that is reflected

> in its significance. (Leontiev & Luria, 1968, p. 347)

So the mastery of socially determined experience changes not only the contents of psychological life, but at one and the same time creates new forms of psychological structure.

Nowhere is this unity of cognitive structure and content more apparent than in Vygotskiian accounts of the developmental process in children. In general, the acquisition of significances takes place in a similar way for all children. A significant adult person separates out objects or events in a child's environment using the historically laid-down system of language, and in so doing changes the environment as perceived by the child. The communication thus established

> turns into a new form for organisation of psychological processes in the growing individual. The function of calling attention to something, which was shared between two people, turns into internally organised activity ... These processes are social in origin, mediated in their structure, and voluntarily directed in their functioning. (Luria, 1976b, pp. 567 - 568)

Take for example the "natural history of the pointing gesture" as an illustration of the way a very young child learns simple non-verbal signs:

Firstly, a child makes a grasping movement (an "organic" reflex) towards an object. Often it will grasp the object, sometimes its hand will fall short.

Secondly, an adult sees this action and intervenes, because she interprets the action as an indication that the child wants the object. "In doing so she has understood the reaching movement

as a pointing movement, she has injected meaning where there was none before" (Sutton, 1980, p. 30)

Thirdly, the child's view of the situation has changed: social and semantic aspects have been introduced which give the action new meaning. The child learns the concept of pointing. Obviously, the concept of "pointing" is embodied in a particular socio-historical instance, and its structure and content ("relations" and "meaning") are mediated to the child to become the structure and content of its cognition. As Sutton (1980) indicates, speech is incorporated in a similar manner, and here he represents very well the argument which Vygotskii develops in Thought and Language (1962, ch. 5):

> Stage 1 The word must have an objective meaning (established in the course of cultural history).
> Stage 2 The objective connection between the word and what it refers to must be functionally utilised by the adult in interaction with the child.
> Stage 3 The child internalises the semantic aspect of the word (he learns what it means). (1980, p. 30)

Words, and the language in which they acquire significance, clearly operate simultaneously as indicators of social and cognitive structure, and it is clear that Vygotskii does not conceive of an epistemological distinction between content and structure in his work.

A more detailed examination of the notion of a significant adult mediator opens up the functional aspect of Vygotskiian psychology. Vygotskii makes it clear that other people, as the bearers of social relations, are the motivating force behind a child's development:

> The active part is here played by the organism which masters the means of

> cultural behaviour supplied by the environment. But the organic maturation plays the part of a condition rather than a motive power of the process of cultural development, since the structure of that process is defined by outward influences. (1929, p. 423)

Older persons of significance to a particular child, notably the mother in our society,[5] actively mediate the historical experience of humankind to her. These significances are seen to be passed from generation to generation in adult-child interactions,[6] so that, for Vygotskii, the motive force which gives rise to cognitive development is intrinsic to the dynamics of society. Notice also, in the last quotation, Vygotskii's historical materialist concern with the child as an active human agent who in the last instance is socially constructed, or mediated (as pointed out earlier, this was Vygotskii's main academic offensive during his lifetime).

Consideration of Vygotskii's notion of a "zone of next development" (ZND)[7] will consolidate my argument here, because it brings the role of a mediator into sharp relief. In Vygotskii's (1978) view, there are two levels of development that exist simultaneously in the developing child: firstly, there is the actual level of development, which is manifest in what a child can do without an adult's help; and secondly, there is the potential level of development, which is manifest in a child's capabilities with optimal guidance from an adult. The gap between these two levels of development is the ZND, and it is obviously an enormously useful contribution to applied developmental psychology. But my immediate concern here is with the way it illustrates the crucial significance for Vygotskii's theory of adult mediators, or "teachers", who transmit the social

world to a child:

> The child's greater or lesser ability to transfer from what he can do on his own to what he can do with help proves to be the most sensitive symptom that characterises the dynamics of the child's development and success. This wholly coincides with his zone of next development. (Sutton, 1980, p. 35)

The roots of higher psychological processes turn out to lie outside of the organism in social-historical forms of activity. It is in this sense that Vygotskiian psychology depends on a notion of the epistemological primacy of the social for its explanation of child development.

It is notions underlying the ZND that explain the course of cognitive development for Vygotskii. As indicated previously, the reconstructive processes which take place during a child's development pass through stages which reflect the child's entry into language, and hence social relations. But Vygotskii does not conceive of these in the grand sense of major stages at particular ages; rather, he refers to the process through which a child goes in any instance of acquiring a given piece of knowledge. Consequently the picture is not nearly as neat as Piaget's:

> We believe that child development is a complex dialectical process characterised by periodicity, unevenness in the development of different functions, metamorphosis or qualitative transformation of one form to another, intertwining of external and internal factors, and adaptive processes which overcome impediments that the child encounters. (Vygotskii, 1978, p. 73)

All that Vygotskiians say is that an older child's ZND is generally, but not invariably,[8] at a more complex level than that of a younger

child because her acquisition of socio-historical forms of activity are more advanced. And they would explain the acquisition of abstract logical forms of cognition by pointing to the mediation of those forms, as they exist in the social relations of any society, by adults to children.

Let me reiterate that this does not mean that Vygotskii denies that the maturation of a child's brain is a factor in development. True, his main effort was concerned with the social-psychological reality of a child's consciousness, but as a rigorous dialectical materialist, he was at the same time concerned with the neurological substatum of the psyche.[9] Leontiev and Luria (1968) describe some of Vygotskii's research on neurological damage associated with Parkinsonism, the results of which are significant in attempting to clarify Vygotskii's views on the relative importance of the organic and socio-historical lines of cognitive development:

> These observations of Parkinson's disease presented themselves to Vygotskii as having a fundamental significance. In place of the naturalistic approach to the work of the brain, a new approach was coming about which used new 'extracerebral' factors to regulate brain activity: the use of external means, 'signs', which had evolved in man's social history, appeared to be a new and very real form of organization for behaviour itself and for forming new functional systems to reconstruct the work of a sick brain. (Leontiev & Luria, 1980, p. 360)

Clearly, neurological conditions are seen to be the necessary basis for any cognitive activity, but they do not provide the motive force for cognitive transformations. The socio-historical development of a child, as indicated earlier, takes place inde-

pendently of structural or biological changes in the brain: the motive force for cognitive development lies outside of the individual child.

Before concluding this chapter, I want to make a few comments about two issues which stem from the dialectical character of Vygotskii's thinking. The first issue has to do with the necessary monism which is part of the dialectical materialist framework of thinking, and the second has to do with conceptions of method which stem from dialectical thinking.

Marxism, as I pointed out earlier, conceives of human consciousness as entailed within practical activity, and hence inseparable from the historical totality of society. In this sense it is radically anti-dualist, and its dialectical thrust challenges the idea of the human mind as a special self-contained world of purely subjective phenomena. From what we have seen of Vygotskii, he is clearly concerned to develop historical materialism in the realm of psychology, and "to find, in life itself, in the conditions of man's being, the real factors that have created his consciousness" (Leontiev & Luria, 1980, p. 339).

Vygotskii's thought is in fact a structural monism which denies that "mind" and "society" are independent of one another. The form and content of cognition are dialectially located within the single totality of conscious human labour.

With regard to questions of scientific method, Vygotskii shares dialectical materialism's general critique of positivist ideo-

logy. Marx is particularly scathing of the positivist idea of knowledge as only that which is constituted by facts given as the real objects of experience. On the contrary, he regards the proper task of science to be the penetration of these "phenomenal forms" to arrive at a rigorous understanding of the real underlying relations which determine any observed social phenomenon. Appearances are misleading, and can only be understood within the theoretical framework of Marxism, as "concentrations of many determinations, hence unity of the diverse" (Marx, 1973, p. 101). Thus Vygotskii echoes this dialectical anti-positivism:

> Marx commented on the phenomenal approach in a most general form when he stated that 'if the essence of objects coincided with the form of their outer manifestations, then every science would be superfluous' - an extremely reasonable observation. (Vygotskii, 1978, p. 63)

And he regards this method as crucial to the success of a scientific psychology, which should "lay bare the essence rather than the perceived characteristics of psychological phenomena" (1978, p. 63)

Marx's (and Vygotskii's) method is known as abstraction, and it refers to the disciplined application of the concepts of historical materialism in order to appropriate the necessary relationships which structure social reality. As such, it is theory-laden scientific activity which checks itself, in the last instance, against observation and empirical research.

Now I have provided an account in this chapter of Vygotskii's theory as an argument that the child is essentially a bearer of cognitive social relations. In many senses, Vygotskii

provides the opposite conception of cognitive development to that advanced by Piaget. To put the difference in a nutshell: Piaget's theory asserts the epistemological primacy of the individual, while Vygotskii asserts the epistemological primacy of the social. It is to this dispute that we turn in the next chapter.

CHAPTER THREE

VYGOTSKII VERSUS PIAGET

> All this talk about integrating the nice bits of Piaget with the nice bits of Vygotskii, and booting out the uncomfortable bits of both - the theory! - is absurd ... it must be rejected for the same reason that all of'naive' psychology's methodological eclecticism must be rejected ... the theories are fundamentally incompatible. (Moll, 1982)

The previous chapters have examined the nature and roots of two different theories of cognitive development, those associated with Piaget ad Vygotskii respectively. It is now opportune to begin to develop a rigorous understanding of the research problem at hand, namely an attempt to resolve the fundamental epistemological dispute which opposes the two theories to one another. The aim of chapter three is to bring back into focus the two levels of "the problem of content in the theory of formal operations" which I touched on in the introduction, and to prepare the way for an account of the research carried out in this regard. In particular, I shall be concerned with various critics of Piaget (notably Buck-Morss) who all, in one way or another, claim that he has taken insufficient account of social content in his theory.

Perhaps it should be pointed out that there is something of a lop-sided aspect to the issues which I deal with here. On a general level, I am concerned to demarcate the terrain of the dispute

between the opposing theoretical positions of Piaget and Vygotskii; but on a specific level, my task is to develop an understanding of the critique levelled, largely implicitly, from the theoretical space of Vygotskii's psychology, which accuses Piaget of artificially separating form from content, and thus losing sight of the crucial social construction of children. My concern as the chapter proceeds will be more and more with this second, more specific aspect.

That there is a fundamental dispute between Vygotskii and Piaget should be clear at this stage, and Table 2 summarises major points of difference between them.[1] The vertical dimension under each theorist reflects the sustained problematic within which he operates: there is

Table 2 : Some comparisons between the theoretical positions of Piaget and Vygotskii

PIAGET	POINTS OF DIFFERENCE	VYGOTSKII
Knowledge originates in biological structures, and through equilibration comes to be the structures of mature cognition.	EPISTEMOLOGICAL POSITION	Knowledge originates in social and historical structures, and through mediation comes to be the structures of mature cognition.
Structural emphasis: the necessary and sequential closure of structures ~~occur~~ accounts for development.	CONCEPTION OF COGNITIVE GROWTH	Functional/process emphasis: the intervention of significant adults accounts for development.
Inside-out: learning follows spontaneously from the activity of biological cognitive structures.	ACCOUNT OF LEARNING	Outside-in: learning depends on the active mediation of social-historical reality to the child.

in each case a coherent collection of principles which articulate on all levels of analysis. Above all else, we can see here what the importance is of the claim that the dispute between Piaget and

Vygotskii is, in the last instance, and epistemological dispute. Their conceptions of learning and development, and indeed everything else that their vast theories elucidate, stem from their respective notions of the source of knowledge, in biology for Piaget, and in society for Vygotskii.

Not that either of them ever really engages the debate with the other, except somewhat tangentially around the issue of "egocentric" speech. Perhaps a few comments on this would be useful: for Piaget (1955), the preoperational child is autistic (or egocentric), which implies "a general inability to take the other person's point of view" (Boden, 1979, p. 60). She lives by herself, so to speak, and has little contact with the world outside of herself. Her behaviour only gradually becomes socialised, which for Piaget is an instance of mental operations being performed on signs outside the child. But Vygotskii has a radically opposed hypothesis, and devotes a chapter of Thought and Language (1962, ch. 2) to criticism of Piaget's position.[2] For him, children are from the very beginning social beings: they use language for communication and problem-solving as soon as any adult begins to mediate the social world to them. It is initially overt and expanded, and gradually becomes transferred into inner speech, so that language is in substance the mental operations of a young child. One can clearly see in this dispute the "outside-in" orientation of Vygotskii being opposed to the "inside-out" orientation of Piaget (see Table 2). Unfortunately, Piaget's replies to Vygotskii on the issue are somewhat cryptic,[3] but it seems that he defends his original notions while at the same time recognising the rigour of Vygotskii's challenge (see for

example, Piaget and Inhelder, 1969, p. 121, and Piaget, 1970b).

Now what this shows, for purposes of this thesis, is that there was at least some kind of awareness of a dispute between their positions on the part of both Piaget and Vygotskii, an awareness which follows the main lines of the accounts I have given of them thus far. And this is borne out by a series of critical comments which Vygotskii makes about Piaget in other contexts. He is, for example, unhappy about Piaget's dualism:

> the children's adaptive behaviour and sign-using activity are treated as parallel phenomena by Piaget ... but the dialectical unity of these systems ... is the very essence of complex human behaviour. (1978, p. 24)

And elsewhere he chides Piaget for underestimating the importance of education (mediation) and practical activity in the construction of cognition (Vygotskii, 1962, pp. 22 - 23), which Vygotskii thinks is a crucial theoretical mistake:

> Piaget's extremely complex and interesting theoretical principles ... assume learning trails behind development, that development always outruns learning, it precludes the notion that learning may play a role in the course of ... development. (1978, p. 80)

Piaget, regrettably, does not say nearly as much in return to Vygotskii, and on the whole neither theorist has really offered a systematic critique of the other. On the strength of my reading thus far, it would appear that there is also no Piagetian nor Vygotskiian who develops such a critique from within the opposing position. This work remains to be done.[4]

I have found a useful starting point for this process in a provocative

and insightful article written by Susan Buck-Morss (1975). In it, she attempts to account for the fact that "in the cross-cultural application of Piaget tests, non-Western children score significantly lower than their Western peers, implying that the cognitive development of the former ... is somehow 'retarded'" (Buck-Morss, 1980, p. 103). Moreover, she operates within a dialectical materialist framework, and this provides important conceptual tools to further an understanding of the implications of Vygotskiian thinking for genetic epistemology. Although I think that there are some flaws in her argument which I shall come to shortly, the overall thrust of the article provides a sharpening of the problem of content with which this thesis is concerned.

The gist of her argument runs as follows: she starts by pointing out that Piaget's desire to develop a universal theory of cognition means that he can never properly grapple with the contradiction which the relativity of cognitive performance across different communities throws up:

> The psychological universalist position - which is taken, with qualifications, by Piaget ... - assumes that a general theory of cognition is possible, and thus appears to stand squarely opposed to ideologies of biological racism; but it cannot account for the frequent chronological 'lag' in test performance of non-Western samples ... without implying another kind of ethnocentrism, the cultural superiority of the West. (1975, p. 36)

So Piaget stands accused of a socio-economic bias. Buck-Morss argues that he mistakenly assumes that the structures of formal operational thought are universal because they are abstract, while particular content is merely contingent on environmental and

cultural factors. In fact, she says, abstract operations are a reflection of the commodity structure of western industrial capitalism, and the abstract formalism which Piaget construes as the pinnacle of all human cognition in fact emerged historically in urban, commercial cultures, and became the dominant mature cognitive structure in people "when, with the rise of Western industrial capitalism, it became the dominant social structure" (1980, p. 104).

The significance of Piaget's work, for Buck-Morss, is that it "presupposes that the most important thing is not so much what the child can do in the concrete world, ... but how quickly he can do without it" (1975, p. 40). So the transition from sensorimotor to preoperational thought is a manifestation of alienation:

> For Piaget, the first great cognitive leap is the prototypical experience of alienation. It is the ability of the child to divorce subject from object, hence to grasp the building block ... of industrial production. (1975, p. 40)

And Piaget's notion of object permanence has similar roots in the process of production - it is embodied in the mental ability to separate the concept of an object from its real, material existence. The progression towards formal operations is, for Buck-Morss, a progression towards a situation where objects take on the appearance of the products of thought, and their origin in social production comes to be obscured, or "reified", by the emphasis on abstract cognitive operations. She cites numerous examples in a similar vein, all of which show that Piaget emphasises categories of cognition which correspond to the modus operandi of the western industrial production process.

Piaget's necessitarian account of cognitive development also comes under attack for its maintenance of a status quo defined by western values: the notion that formal operations are some kind of universal pinnacle of human thought places "more value on the idea than reality" (1975, p. 41), which encourages a split between concrete, practical activity, manual labour or "doing" on the one hand, and abstract activity, mental labour or thinking on the other. And so human beings (and Piaget) mistake the contradictions of society for logical contradictions: "the mind ... labours over the latter, while leaving reality unchanged" (1975, p. 41).

Buck-Morss now comes to the culmination of her argument: the reason that western children perform much higher on tests of formal operational ability than Third World children is "not because they are more intelligent, but because abstraction structures their world" (1975, p. 41, my emphasis). So that is why western children are quick to grasp the content-independent logical structures which dominate industrial society, and it is also why their rural counterparts usually tend to be much more competent at assessing perceptual cues which indicate the properties of an object - concrete activity structures their world. The numerous studies mentioned in my introduction which show a developmental "lag" in the attainment of formal operations would be, and are, interpreted by Buck-Morss (1975) as evidence of her overall thesis.

Thus, Susan Buck-Morss posits a structural correspondence between cognitive operations and social reality. In so doing, she draws heavily on the theoretical Marxism of the early-20th Century

Hungarian philosopher, Lukács, to demonstrate the necessity of this anti-dualist view of the socio-historical determination of consciousness, or the "socio-economic mode of production of the mode of consciousness" (1975, p. 37), as she puts it. What she seems to want to do is to apply Lukács' rejection of a Cartesian dualism between form and content in an attack on Piaget:

> What Lukács tried to demonstrate was that there was a structural identity between mind and society and that the logical structure of abstract formalism, far from universal, is itself the product of history, that the form of cognition is itself social content. (1975, p. 37)

And on the whole she succeeds by producing a telling critique of Piaget's separation of the form and content of cognition, and hence of his notion that the motor of cognitive development lies in biological activity.

But I think that there is one crucial mistake in Buck-Morss' argument that needs to be corrected to get her position straight. One cannot help noticing that she conceives of a somewhat naive identity between industrial society and "the West": as Buss (1979) puts it:

> 'the problem' is that for Buck-Morss the high point of abstract formal thought is directly tied to the underlying structure of Western industrial capitalism, yet it is apparent that societies with communist political economies share the same pervasive organising principle of abstract formal thought. (p. 120)

If Buck-Morss is correct that capitalism produces a premium on formal operational thought, how are we to account for the same mature cognitive structures being present in, say, Yugoslavian

or Russian children?[5]

Clearly, in this detail she is wrong. And I think that it is actually contrary to her overall dialectical materialist commitments. She challenges Piaget's separation of form from content on the grounds that he abstracts cognition from a content-specific politico-economic structure; but she herself is trapped in the mirror-image of this, in that she abstracts a particular form of consciousness, abstract cognitive operations, from a specific mode of production, capitalism, and then relativises it to the point where it is inconceivable in any other advanced industrial mode of production.[6] So she does not quite get out of a distinction between form and content herself. Significantly, Vygotskii can provide a corrective for Buck-Morss' error on this point, which would restitute it to its proper place in an anti-dualist dialectical materialism: he stands opposed to a naive cultural relativism, repeatedly emphasising (1978, passim) that human society, and hence the cognitive development of children, is in a constant process of material transition to more advanced historical forms. Thus, if formal operations are entailed within the industrial super-structure of capitalism, then they must also be a minimal condition of the industrial super-structure of socialist society. If we read Buck-Morss' article in these terms, then the mistake is corrected, and it becomes a clear argument that the structures of an industrial, technological society entail abstract formal operational cognitive activity, in distinction to the concrete activity of pre-industrial social formations.

So here there seems to be common ground between Buck-Morss and the

Vygotskiian position. An examination of the research conducted by Vygotskii and Luria in remote Russian peasant communities, which I mentioned in the introduction (see Luria, 1976a and 1976b), reveals that their accounts posit a structural identity between cognition and socio-economic relations.

The cognitive development of the peasant children, and indeed the mature cognition of adults in those situations, was found to be retarded, not in the pejorative sense, but in the sense that the social relations which structured their everyday lives had not yet undergone the historical and technological transformations which would bring with them abstract psychological operations. The highly developed concrete thought patterns which they exhibited were a reflection of the dominance of concrete forms of daily activity in these communities at that particular point in their history. Now it is obvious that all of this amounts to a remarkably similar account of the reasons for cognitive developmental "lags" in children in non-industrial communities to that advanced by Buck-Morss,[7] especially on the reading of the latter's position which I outlined earlier.

I am now in a position to clarify what Buck-Morss' importance is for an understanding of the conceptual and theoretical space that divides Piaget from Vygotskii. Her criticism of Piaget is that his essentially biological conception cannot account for the structures of cognition in a child: in his search for a universal theory of the development of knowledge, Piaget has failed to take into view the crucial socio-historical determinants of cognitive

development. The account I have provided of her article makes it clear that Buck-Morss identifies a "problem of content" in Piaget's work - his inability to see the origins of formal operational thought in a unity of mind and industrialised society - and I think it is reasonable, given their common ground, to say that Vygotskii's work contains the same implicit critique of genetic epistemology.

Now there are a number of other critiques of Piaget's position which I have come across, and some add important dimensions to our grasp of this increasingly more complex problem of content in his work. There are two perspectives in particular which deserve attention, and I shall deal with each briefly.

In the first place, there are those critics of Piaget who operate within various shades of what we might call a neo-structuralist position. What these theorists share in common is a conviction that the surface phenomena of the social and psychological domain (and it is one domain for them, even if it comprises different objects of analysis) are to be explained by structural determinants beneath the surface. Put differently, we can only explain human consciousness by revealing its location in the structural totality of human society. So, for example, Venn and Walkerdine (1978), attack Piaget's theoretical removal of the human subject from its location in the overall structures of society. For Piaget, they argue, it is the subject's actions alone which enable the construction of cognitive structures, and he makes no reference to "knowledges themselves and their social production" (p. 79) nor to the "role of theory in producing the objects of knowledge" (p. 79). Piaget's

error, in other words, is an epistemological mistake which ignores the source of knowledge in language and history: the real world is superceded in his formalism, and the resultant individualist conception of the subject entails its loss. And Wilden (1972), writing in the complex theoretical language that so many structuralists are fond of, echoes Venn and Walkerdine's concerns: Piaget's epistemology is "the epistemology of closed systems" (p. 326), and as a result the notion of activity which he postulates is a myth designed to handle the problem of isolated structures which his epistemology throws up: "like hollow billiard balls driven by rubber bands" (p. 326). Hence, Piaget's child is a child separated from its environment by an imaginary ideological barrier:

> Piaget considers the child to be an object in a world of objects, which are there simply to be used ... and not also to be listened to and communicated with. (1972, p. 327)

And this, says Wilden, is Piaget's unacceptable "alchemical scientism" which rests on the myth that structures can be governed from within the individual:

> the individual is conceived a priori as an entity or as a 'bounded substructure', the actual open-system relationship of 'individual' and 'environment' - in which boundaries = communication - is implicitly or explicitly conceived of as a relationship between two closed systems, each of which can do without the other until or only for as long as they bump into each other in the street. (1972, p. 328)

For these structuralists, structure is by definition social, and Piaget's dualism shatters the totality and substitutes it with an organism bound biological structure.[8] For Venn and Walkerdine

(1978), and Wilden (1972), this is a problem of content which must inevitably mean the rejection of genetic epistemology as a meaningful appropriation of human cognition.

In the second place, the important queries that Hamlyn directs at Piagetian theory point to another face of the problem of content which I am developing here. Hamlyn (1971, 1973, 1978) offers, as we saw earlier, a Cartesian reading of Piaget, and he goes on to find problems with Piaget's consequent notion that knowledge has its primary source in the individual. In doing so, he poses a Wittgensteinian challenge to Piaget, and a brief aside is necessary here to clarify what this means. In the Philosophical Investigations, Wittgenstein argues that there can by no such thing as a "private language", by which he means "sounds which no one else understands but which I appear to understand" (1972, p. 94). Schematically, his argument proceeds as follows: (a) for there to be a language there must be some kind of rules; (b) for there to be rules, there must be agreement between people; (c) hence, language cannot be independent of society - the notion of a private language is absurd. Now it seems to me that a similar argument can be pressed against Piaget: meaning must in principle be social, since there can be no such thing as knowledge or truth without agreement. This implies, I think, a rejection of the epistemological primacy of the individual, since it sees knowledge as constituted by, and within, social processes. Coming back to Hamlyn, it is obvious that he shares this reservation about genetic epistemology: He says, for example, in criticism of Piaget's notion of activity in the child:

> A person is a social being from childhood, and the knowledge that he has to acquire is equally socially determined in an important sense. For knowledge presupposes criteria of truth. (1973,

p. 188)

And he cements this a little further on:

> the child is in the world and part of the world from the beginning and is put in the way of making ... distinctions by adults ... by the circumstances of his upbringing. (1973, p. 190)

So Hamlyn also sees a certain kind of problem of content in Piaget's work, and one of his projects is to provide a more adequate account of the acquisition of knowledge which will build on Piaget's Kantian insights but overcome the problem of the epistemological primacy of the individual in his work (see Hamlyn, 1978).

So what then do Hamlyn and the neo-structuralists provide for a sharpening of our focus on the "problem of content" which we have seen that Buck-Morss and, implicitly, Vygotskii identify in Piaget's theory of formal operations? Clearly, both Wilden (1972) and Venn and Walkerdine (1978) argue that Piaget's theory misconstrues the structures of knowledge as the structures of the organism, and this is for them an anti-structuralist move. And Hamlyn's challenge is that Piaget does not take sufficient account of the socialisation of children in his explanation of their cognitive development. Taken together, and to the extent that they are compatible within a dialectical materialist framework,[9] these insights provide a much richer conceptualisation of the social "blindness" which we have seen revealed in Piaget's theory.

I am now in a position to begin to concretise the research problem which derives from all of this. Up to this point I have developed an abstract theoretical account of the developmental relationship

between socio-economic structures and different forms of cognitive structure in children, but it is important not to lose sight of the reality of these relationships as they are manifested in concrete psychological processes. In fact, as with any theoretical discourse, there are a range of formulations of the problem we are dealing with here (the problem of content in genetic epistemology), each of which appropriates and accounts for its object of analysis in differing degrees of abstraction.

So the most abstract formulation of the problem, which this chapter in particular has spelt out, is an argument that cognitive structures cannot be conceived of outside of their entailment in the material social relations of production. The acquisition of knowledge, in other words, can only be adequately appropriated by a position that posits the epistemological primacy of the social. And the claim here is that there is a crucial error in Piaget's epistemological individualism.

On a less abstract and more concrete analytical plane, my arguments in this chapter and especially in the introduction have shown that the problem is manifest in the presence of concrete operational priorities in the cognition of non-urban, pre-industrial communities on the one hand, and formal operational priorities in urbanised, industrialised cognitive modes on the other. There is, to put it another way, a structural correspondence between the dominant social relations and the dominant cognitive operations in any particular social formation. While Piaget recognises this on an empirical level, his theory stands accused of a deficiency in trying to account for it.

Moving to a more concrete formulation still, it is necessary to grasp the problem as it specifically might manifest itself in the South African context. Importantly, I am here beginning to move away from the foundations of available research on cognitive development, and to open up an area in which I believe a great deal of research has yet to be done. The research problematic here can be stated as follows: there is evidence that the cognitive development of children is "retarded" when, as I put it earlier, the relations which structure their everyday lives have not yet undergone the historical transformations which will bring with them abstract, formal operations. Understood within the realities of apartheid, this translates into a conviction that certain communities, particularly those in the bantustans, can be so fundamentally underdeveloped and epistemologically retarded by mainstream societal processes that abstraction is structured out of their everyday existence, so to speak. The strong possibility exists that the systematic creation of overcrowded bantustan enclaves, as well as the underprovision of housing, education, health care and social services both here and in the working-class townships, produces what we might call the social relations of underdevelopment, which in turn systematically retard potential cognitive growth and elaboration in children.

So at its most concrete formulation, the problem might take the form of an hypothesis that we would expect to find differences in the cognitive performance of rural and urban South African children, and also between children in the townships and those in more affluent city areas, where the latter in each case tend to have a higher level of formal operations than the former.[10]

Now we are left with a sense of a very complex articulation of a theoretical discourse (the theory of cognitive development) and the object which it designates and opens up for analysis (in this case, the construction of abstract, propositional operations in children). I think you can see why I said at the outset of this thesis that the problems I investigate here cannot be settled on an empirical level - certainly, there is an empirical aspect to be investigated, but the problem of content in genetic epistemology is a problem about whether or not it has the theoretical account which is to make sense of "the empirical" straight. The concrete and the abstract formulations of the problem need to be taken into view to make any sense of it.

This is why the research which I report on in the next chapter has both an "empirical level" and a much more fundamental level concerned with "theoretical adequacy". Obviously, my whole enterprise rests on the reality of cross-cultural cognitive differences in the attainment of formal operations, and as you will see, I have established this to a surprisingly stark degree. But the problem of content itself is a problem about the theoretical appropriation of that reality, and so on a more abstract (and tentative) level my research tries to find indications that social structures might be crucial to the development of formal operational structures. The way will then be open to attempt to determine whether Piaget's theory has the fatal flaw it is accused of having.

CHAPTER FOUR

FROM FARM SCHOOL TO PRIVATE SCHOOL

> There is no Piagetian test in the sense that we use the word "test". Piaget never claimed to have any test.
> Hans Furth (1980, p. 138)

Bearing in mind the conclusions that have been reached so far, it is clear that the implicit Vygotskiian challenge that Piaget loses sight of the centrality of the social construction of cognition can be conceived on a number of different levels of abstraction. In this chapter, I report on research designed to make sense of a most concrete instance in which the problem can be discovered, namely, the relative cognitive developmental levels of different cultural and class groupings in this country. It was carried out between October 1980 and July 1982 in different rural and urban centres in the Transvaal, and had two broad purposes:

1) to establish, using Piaget tasks, whether there are differences in the attainment of formal operations in different communities in South Africa;
2) to establish whether or not the determinants of cognitive development and deprivation can be discovered in social processes and practices.

At the outset it is necessary to say something about the kind of research that is appropriate to these tasks. The determination of the level of a child's cognitive development, on Piaget's model, is

not a matter of measuring her on any interval scale designed for that purpose; rather, it is a matter of making informed theoretical judgements and interpretations of the meanings of her cognitions, both for herself and for the researcher operating within a particular framework, using Piaget's clinical method. Similarly, the attempt to come to grips with the socialisation of a child within a particular structure of social relations can hardly rest on the verification (or, to use Popper's more sophisticated notion, falsification) of nomological statements linking discrete variables to each other. In other words, the hypothetico-deductive method so popular amongst research psychologists is inappropriate to the qualitative concerns of the research I report on here.[1]

Now the distinction between quantitative and qualitative research methodology is well-established in both psychology and sociology (see for example Bogdan and Biklen, 1982), although there are many different ways of formulating the distinction. For example, Harré et al. (1978) refer to it as the distinction between extensive and intensive research designs, and very often the difference between experimental and observational techniques in psychology is portrayed is these terms (see Krech et al., 1974). Bogdan and Biklen (1982) have identified five features of qualitative research, and a brief examination of each of these will help to show why the present research is necessarily of this type:

i) "Qualitative research has the natural setting as the direct source of data and the researcher is the key instrument" (p. 27).

Both broad research aims identified above rely on information

which is forthcoming from loosely structured interview situations which are regarded as a means of appropriating real relations which lie "beneath the surface": cognitive relations in the first instance, and social relations in the second. The interviewer is in each case an important participant in the generation of information.

ii) "Qualitative research is descriptive" (p. 28).

None of the material dealt with here can be accurately described by numbers. The closest it goes to being quantifiable is in the nominal descriptions of whether or not children have attained formal operations. But it is in the reports offered by children in interviews that we can find the clues which unlock an understanding of what is being studied - the meanings of cognitions for children, and their material experiences of social relations.

iii) "Qualitative researchers are concerned with process rather than simply with outcomes or products" (p. 28).

Obviously, this search for meaning aims to discover the processes which determine particular forms of cognitive operations in developing children, both in cognition itself and in more general forms of everyday activity.

iv) "Qualitative researchers tend to analyse their data inductively" (p. 29)

My concern here is obviously to induce certain conclusions about the way we would explain the construction of formal operational thought from research done with specific samples in a specific socio-economic context. Keeping in mind that any examination and description of a particular sample is

theory-laden, it can reasonably be said that my concerns on this concrete level are concerns of induction. As I pointed out earlier, the conventional form of the deductive method is inappropriate.

v) "Meaning is of essential concern to the qualitative approach" (p. 29)

From what has gone before, it should be clear that meaning is of essential concern to an elucidation of what I have called the problem of content in the theory of formal operations.

There is another reason why the traditional quantitative concerns of psychological research are inappropriate to the tasks at hand, although this is a reason on a different conceptual plane to those that have just been dealt with. Both Piaget and Vygotskii, as I pointed out in the second and third chapters respectively, conceive of their methods as types of abstraction (the former based on the tenets of his own genetic epistemology, the latter consistent with the Marxian use of the term). So each conceives of his method as a qualitative construction of a set of concepts which will reveal, through a particular empirical abstraction, the underlying structures of cognition. Both of them would, I think, see the distinction between quantitative and qualitative research, not simply as a difference in "approach", but as a fundamental epistemological opposition between positivist method on the one hand, and structuralist method (or dialectics) on the other. Both, as we have seen, reject the former and advocate the latter, although in different ways. It seems that the qualitative method is necessary to the concerns of this thesis, although I shall not attempt an extended defence of this

assertion here.

To say something now about the qualitative methods that are applied in this research: each of its two broad purposes necessitated a particular kind of interview strategy designed to reveal the underlying relations of cognition and of social production respectively. In the first case, Piaget's clinical method was applied, and in the second case the method of ethogenics developed by Rom Harré and his associates was applied (see Harré, 1974, Harré and Secord, 1972, and Harré et al., 1978). I shall deal with each in turn.

We have seen that Piaget's theory accounts for the most abstract stage of human cognitive development, namely formal operations, in a unique manner, that is, by reference to the phylogenic and ontogenic origins and development of the processes of thought. We have also seen that this produces a particular notion of method: in fact, Bovet (1974) argues that it is precisely this uniqueness which necessitates a particular method of "exploration", one which can reveal the processes of reasoning in a child, and hence provide the grounds upon which claims about her underlying cognitive structures can be made. The method in question, of course, is Piaget's clinical method.

The term "exploration" is significant here (in distinction to "testing" or "measurement") because it captures the idea of a dialogue between the child and the interviewer, which is so crucial to the qualitative concerns of Piaget's work. Bovet goes on to point out that the purpose of the clinical method is to discover on what type of reasoning

it is that the child has based her responses, and that it does not stop at the simple recording of correct or incorrect responses to questions (it is this sense that Furth thinks that there is no such thing as a Piaget "test"). The child is presented with a particular task which can be approached in a number of different ways, depending on the cognitive operations available to her. She is then asked to solve a particular problem related to the task and, importantly, to explain why she solved it in the way she did. It is reports elicited by this latter strategy, elaborated in conversation with the interviewer, that provide an indication of the type of thinking she operates within at that particular point.

In passing, it is important to note that Vygotskii regards Piaget's clinical method in a very favourable light (see for example 1962, p. 11 and 1978, p. 27). For him, it brings to the surface real, concrete instances of thought characteristic of children at different ages, although he would differ from Piaget in the final account he gives of them. Significantly, the roots of this agreement lie in the fact that both Piaget and Vygotskii rely on the method of abstraction, and hence can be said to share a realist programme with respect to their notions of empirical evidence.[2] So the use of the clinical method in this research is not inappropriate to a consideration of Vygotskii's theory and its challenge to genetic epistemology.

With regard to the method of ethogenics, Harré (1974) defines it as "the kind of psychology which concentrates on a meaning-and-rule analysis of episodes (units of social life)" (p. 250). By this he means that it is concerned to discover the system of rules which

governs a particular person's actions, and hence the meaning that those actions have for her. Such rules are not idiosyncratic, but are shared social relations which take on a "ritualistic form" and control and organise "the flow of human actions", or episodes, which are the substance of psychological life.

In the search for the relationship of cognitive operations to social structure, ethogenics provides a particularly useful methodology, not least because it provides a means of discovering the essential features of social structure in the reports that children offer of their lives:

> The fundamental ethogenic hypothesis that links acting and accounting is the idea that an individual's ability to do either depends upon his stock of social knowledge. Such knowledge forms a single system in each individual person so that his actions and his accounts are performances drawing upon one corpus of knowledge. This knowledge is revealed in different ways of acting and in accounting since each is directed to a different end. Actions are the means by which we accomplish social acts, while accounts serve to make what we do intelligible and justified. Our studies are aimed at revealing this knowledge and exploring its structure. (Harré et al., 1978, p. 15)

So the rules which govern social activity can be discovered in the meanings which children reveal in the course of, say, an interview.

The effectiveness of the method is based on the depth of analysis which it can offer by virtue of its qualitative, or "intensive", nature:

> The extensive method is sure but slow, the intensive deep but hazardous ... In the ethogenic approach we follow the example of chemists and anatomists and adopt the intensive design, that is, we undertake a detailed study of a few cases selected as typical. We are sure of the detailed validity of our analyses of our cases.

> We can only hypothesise that they are typical. (Harré et al., 1978, p. 20)

Once the rich detail is obtained, it is possible, says Harré (1974), to pick out typical situations from the accounts which become the prime analytical devices of ethogenics. They allow us to characterise and categorise the social relations (rules) which give structure (meaning) to the accounts and activities of everyday life. And if there is some way that we can find some support for the hypothesised typicality of the small samples we work with, then the ethogenic method is that much more effective.

To conclude these brief comments on ethogenics: the method is one which is eminently compatible with both Piagetian and Vygotskiian procedures. I have already made the point that these two theorists share a realist conception of the task of any science, and Harré too is a rigorous realist. His method, much like those of the other two, is concerned to abstract from empirical accounts a set of concepts which, when developed, can reveal the underlying structures of human consciousness or cognition. In fact, Harré (1974) explicitly acknowledges his debt to Vygotskii for the definitive realist principle of ethogenics which claims that reports can give us an entrée into the underlying social relations which determine their form: just as Vygotskii (1962) insists that words are only intelligible as tools in particular social practices, so ethogenics rests on the insistence that one can "never analyse a psychological process into units ... below the meaning level of the original phenomenon" (Harré, 1974, p. 248).

This, then, concludes these general comments on the qualitative nature of my endeavours, and I am now in a position to report on the

research project itself.

Expectations

At the risk of being repetitive, my purpose here is to glance back to the two broad research tasks which I outlined at the beginning of the chapter, and to bring out the questions which each poses for this concrete investigation of the cognitive development of South African children. As I indicated in chapter three, the first part of the research can be formulated as an investigation of the related hypotheses: (i) that urban children will tend to show a higher incidence of formal operational thought than their rural peers; (ii) that middle-class city children will tend to show a higher incidence of the attainment of formal operations than working-class children in the townships. So the first part is an empirical question which can be ascertained by the application of Piaget tasks. The second part of the research is more tentative and exploratory, and it is concerned to seek possible correspondences between the dominant cognitive structures in children and the dominant social relations within which they operate. It is concerned, in other words, with the concrete instances of a broader theoretical question about whether Piaget or Vygotskii better appropriates the real determinants of abstract, propositional operations.

Subjects

The abovementioned research aims necessitated the selection of subject populations which would be representative of the diversity of culture and class affiliation in South Africa. Contemporary sociological analyses of this country have established all kinds of

contradictions in the social formation,[3] some stemming directly from the dominant capitalist mode of production, some embedded in the material bases of apartheid, and still others expressed in various forms of ideological and political division and struggle, but it is possible to establish broad distinctions between different communities on the basis of important socio-economic conditions pertinent to this analysis of cognitive development. The subject populations selected for purposes of this research were thus treated as "informed" a priori categories whose legitimacy received some corroboration once samples had been drawn from them.

So four samples of 10 children each were randomly drawn from all the available twelve-year-olds at each of four South African schools:[4] (1) a farm school in the Groot Marico district of the Western Transvaal,[5] (2) Temba Primary School in a township of that name adjoining Hammanskraal, (3) Mmatlhame Higher Primary in the rural village of Mahubane, about 30 km. north of Hammanskraal, and (4) St. John's Preparatory School in Houghton, Johannesburg. Twelve-year-old children were selected because it is at that age that children ideally manifest formal operational thought for Piaget, and sample sizes of 10 were arrived at to make it possible to carry out all interviews at any one school within a day (each interview took from 30 to 45 minutes to complete) - bearing in mind, of course, that small samples are consistent with the qualitative methods used in this research.

In order to discover whether the a priori socio-economic categories which defined the broad parameters of each sample population were

legitimate, various features of the communities were observed, and initial interviews conducted with the children themselves, and in some cases their teachers, parents or relatives. The following details emerged for each sample:

A) Farm School: All the children's parents were farm labourers; all lived in overcrowded conditions, ranging from 6 people sharing a one-roomed hut to 14 people sharing a two-roomed hut, the average monthly income of these households was in all cases less than R75, which meant that these children could not afford adequate school books, stationery and clothing. Only four of the children lived with any adult who was literate, and then only rudimentarily so. As one of the two teachers at the school put it in discussing the effects of these living conditions on her pupils: "I teach, but the life is bigger than me."

B) Mmatlhame H P: Seven of the children's fathers were migrant workers on the Witwatersrand, Pretoria or (in one case) Phalaborwa, whom they saw only once or twice a month (the remaining three said that they did not have fathers). It was difficult to establish if all the absent fathers actually had jobs or if they were away in search of work, but on the whole the former seemed to be the case. All the children lived in small houses with their mothers, siblings and other relatives (or in three cases where mothers were also migrants, with members of their extended family). All the pupils indicated that they were very poor and did not have a lot of money, although income statistics could not be obtained. The principal of Mmatlhame indicated that "less than 10%" of her pupils could afford the books and stationery required at school, and confirmed

the impression of extreme poverty obtained from her pupils.

C) Temba Primary: All the children's fathers were workers at factories in either Babalegi (which is an industrial township visible from Temba) or Pretoria; nine had mothers of whom six were unemployed, two worked as domestics in Pretoria and one worked at the Jubilee Hospital in Hammanskraal. All lived with their immediate families in "matchbox" houses in Temba; the mean monthly income of six of these households (we were unable to obtain details for the others) was just under R200.

D) St. John's Prep: All the children came from wealthy families: six were the sons of businessmen, and four the sons of farmers in the Natal midlands. They were all boarders at the school's hostel, and saw their families during school holidays or, in some cases, at weekends.

Now all of this suggested a high degree of corroboration of the assumed differences between sample populations, and the research was able to proceed with confidence on this score.

It is interesting to note that all the children across all four samples were either in Standard IV or V, and for the purposes of this study, their schooling backgrounds were deemed to be similar.[6] Now I initially suspected that this was a freak occurrence - it is well-known that black (african) pupils in this country are often "over-aged" in relation to the level of schooling they are receiving - but an examination of DET statistics revealed this to be unfounded. Table 3 shows that the massive dropout and failure rate associated with Bantu Education takes place largely between Std 6 and Std 8, and it is presumably possible to extrapolate from this to say that

the tendency for many pupils to be over-age is also most prevalent

Table 3 : Enrolment by standard of african pupils in certain standards between 1974 and 1978
Source: Blignaut (1981, p. 59)

	1974	1975	1976[b]	1977	1978[c]
Std 4	259944	280434	302647	317824	254460
Std 5	210704	221019	232723	281871	226856
Form 1/Std 6	282778[a]	294813[a]	257505	233117	178560
Form 2/Std 7	63442	91267	133476	177635	134303
Form 3/Std 8	42588	34392	73874	64483	97666

Diagonal bands represent the hypothetical progression of pupils through their schooling.
a. Up to 1975, there was both a form 1 and a std 6 for african pupils. Figures for these two years of study are lumped together for 1974 and 1975.
b. Transkei statistics excluded after 1975.
c. Bophuthatswana statistics excluded after 1977.

in secondary school. So the uniformity of level of education of the samples seems to be reasonable.

Apparatus[7] and Procedure

The subjects were all individually interviewed, using Piaget's clinical method to determine their respective cognitive developmental levels, and using the method of ethogenics to attempt to find indications of their embeddedness in particular forms of social structure. Each interview proceeded as follows:

i) The interviewer established a general rapport with the subject by engaging in general conversation with him/her. It was during this initial phase that the details of the subject samples which I have already reported on were obtained (insofar as they came from the children themselves).

ii) The subject was presented in turn with Piaget tasks of classification, conservation and seriation, and asked to explain his/her reasoning in solving them.

iii) A loosely structured interview guided by a questionnaire was conducted to obtain various biographic details and accounts of the socialisation and social experiences of the subject.

In all cases, the subjects were interviewed in their home languages, Setswana or Pedi in the case of samples A, B and C, and English in the case of sample D. For the former three samples, black interviewers who were thoroughly briefed on the requirements for the interviews were used. They were both registered at the time for Psychology III at the University of the Witwatersrand, and had a working knowledge of cognitive developmental theory which helped ease the course of the research considerably. The interviews for sample D were conducted by myself.

Three Piaget tasks were used. Each was designed to determine the presence or absence of formal operational thought on one of the classical modes of reasoning identified by Piaget, namely, classification, conservation and seriation. There is no such thing as a standardised Piaget test (as we have already seen Hans Furth pointing out), but the important thing in putting together an appropriate task on which the clinical method can be based is to draw on successful material used by past researchers, and to make sure that it has no cultural biases in relation to the particular subject population one is dealing with. I drew heavily on Labinowicz (1980) in constructing the tasks used in this research.

The classification task used asked children to examine nine

miniature plastic animals, each of which was one of three colours, as depicted below:

(1) BLACK COW	(2) WHITE HORSE	(3) BROWN PIG
(4) BLACK HAWK	(5) WHITE CHICKEN	(6) BROWN SWALLOW
(7) BLACK ANT	(8) WHITE SPIDER	(9) BROWN FLY

Now the first point to make is that all the animals were familiar to the children at the time they were interviewed. This was ascertained in two ways: firstly, the principals of the schools, and in the case of samples A, B and C, the teachers of the children, were asked to confirm that in their opinion there would be this familiarity,[8] and secondly, the children themselves were asked to identify and say something about each animal before proceeding with the classification task proper. What we were attempting to avoid here was a situation similar to that discussed by Serpell (1976), in which Okonji found that when miniature models of animals were used in classification tasks, Nigerian and Scottish children performed similarly, whereas objects commonly seen only in Scotland led to higher performance in the latter group.

The instruction to each child then was:

> Here are nine animals. Please put them into three groups that go together.

And having completed the task:

> OK, now tell me why you put them in these groups.

Now there are many combinations which any child might come up with. For example, one child in sample A classified (1), (2), (3), (5) and (9) together as "animals on the farm", (4) and (6) as "birds in the sky", and (7) and (8) together as "the spider eats the ant."

But the most common classifications across all four samples (31 of the 40 cases) were either equivalent to this combination, which I shall call P:

(1)(2)(3) = "farm animals"

(4)(5)(6) = "birds"

(7)(8)(9) = "insects" (n = 24)

Or to this combination, which I shall call Q:

(1)(4)(7) = "all black"

(2)(5)(8) = "all white"

(3)(6)(9) = "all brown" (n = 7)

These performances themselves are not an indication of formal operational thought, and indeed any concrete operational child can respond to class inclusion tasks of this kind in the presence of objects (Labinowicz, 1980, p. 74). The way we were able to ascertain the absence or presence of formal operational ability at this point was to then ask questions which cut across the hierarchical categories the child had set up. So to a child who had come up with P, we might have asked any of the following:

> If all the brown animals were killed, would there be any birds left?
>
> If I put the fly with the birds, how many brown animals will be left?
>
> If all the birds were killed, would there be any animals left?

As Labinowicz (1980, p. 75) points out, children who have not yet attained formal operations have difficulty in understanding the relations at different levels of the classification hierarchy, because their concrete referents are removed by the nature of the cross-cutting questions. On the other hand, formal operational thinkers "readily classify and reclassify large groups of objects

in different ways, realising that each is possible at the same time" (1980, p. 75), which is an indication of their ability to engage in abstract, hypothetical operations. So the classification task used allowed us, by means of the clinical method, to determine whether or not each subject had achieved formal operations.

To turn now to the conservation task which we used: a classic and very simple Piagetian task was replicated here, and it is described well by Figure B. Once again, both concrete operational and formal operational children are quite capable of solving the problem, but

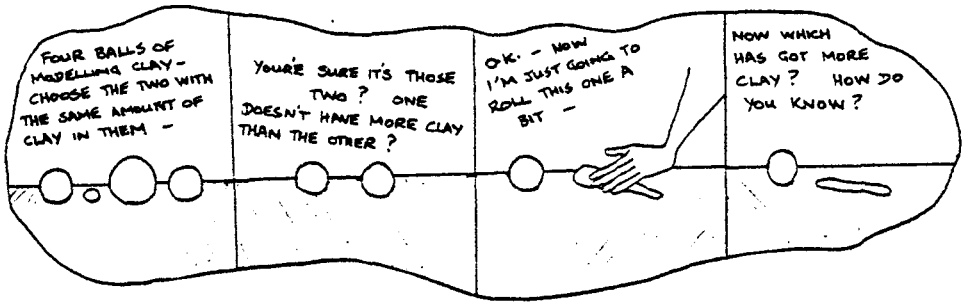


Figure B : A Piaget task to ascertain the conservation of volume in children

the quality of their responses allows us to determine on which level they are operating. As Labinowicz (1980) points out, the concrete operational thinker will justify her responses in a very systematic, painstaking way and will attend very closely to the concrete referents (the lumps of clay) in providing this account. She will exhibit the basics of at least one of the logical capacities of compensation, identity and reversibility in her thought.[9] So a careful application of the clinical method can determine whether a

child is operating on the concrete operational level or not.

On the other hand, the formal operational thinker responds somewhat disdainfully, or abstractly, to the task:

> Since the results are so obvious ... he may refuse to take the question seriously. He might choose to focus on minutae such as the amount of clay left on the surface of the table ... If he takes the question seriously, he could consider it in the absence of objects. (Labinowicz, 1980, p. 73)

So in addition to carefully assessing the style and quality of the subjects' responses to the task, we also asked them to describe the problem to us when all the clay had been put together again.

Perhaps it would be useful to pull together the criteria by which the absence or presence of formal operations was determined on this conservation task. If the child, in solving the problem, showed a noticeable concern with detail and a strong focus on the concrete aspects of the problem, then he or she was treated as a concrete operational thinker. If, on the other hand, there was evidence of abstract thinking and the ability to conceive of the problem once the clay was no longer there to provide clues, then the child's thinking was deemed to be formal operational in character.

The final Piaget task used was a <u>seriation</u> problem. Labinowicz (1980, p. 77) points out that concrete operational thinkers are quite capable of ordering objects according to, say, increasing size or colour intensity, but tend to revert to intuitive logic when presented with ordering problems in a purely verbal form (e.g. a syllogism). So this task enabled the classification of the subjects as either concrete operational or formal operational

according to whether they were able to solve a syllogism or not.

It was necessary first to establish that basic ordering ability was present in the subjects, so each child was asked in the initial part of the exercise to order a set of Cusinaire Rods "from the biggest to the smallest". They all accomplished this concrete operational task relatively easily and systematically by moving rods into a particular order (a concrete process). Each subject was then asked to solve a syllogism comprising two parts which demanded an abstract seriation ability, as follows:

For samples A, B and C:
1. Imagine three children standing together. Sandile is taller than Oupa, and Sandile is shorter than Jacob. Who is the tallest? Why?
2. And if Pule, who is just as tall as Sandile, comes along, who now is the tallest? Why?

And for sample D:
1. Imagine three children standing together. James is taller than Tim, and James is shorter than Danny. Who is the tallest? Why?
2. And if Freddy, who is just as tall as James, comes along, who now is the tallest? Why?

Each of the tasks was written down for the subjects and the problem explained carefully. Now once again, it was the clinical method, and not the answers themselves, which was used to determine the level of cognitive development of each subject on this abstract seriation task. Even if an intuitive guess happened to be correct, the question "why?" opened up a dialogue between interviewer and subject which facilitated classification of the revealed reasoning processes into either "formal operational" or "not-yet-formal operational."

To conclude this discussion of the first part of my research procedures,

a few general comments are necessary. It can be seen that very simple manifestations of formal operational thought were obtained on the tasks used. More complex manifestations such as "conservation of displacement volume" (see Labinowicz, 1980, p. 73) or the "INRC grouping" (for an excellent discussion of this problem, see Easley, 1964) were not explored simply because I was dealing with children who, at 12 years, are ideally at the interface between concrete and formal operational thought - if marked differences could be discovered on such simple tasks, then the findings would be that much more significant than any obtained using complex tasks. The actual classification of subjects' explanations of their thinking was facilitated by taped records of the interviews, which were then analysed in detail by myself and the other interviewers immediately after each phase of the interviewing was completed.

The second part of the interview was conducted within the broad framework of ethogenics. Each subject elaborated on a loosely structured questionnaire which was used to guide the interviewer in seeking accounts by the children of their social experiences (see Appendix 1). The substantive content of the questionnaire centred on four issues, namely the play activities of the children, their creative energies, the type of knowledge they had of the workings of a motor-car, and a typical day in each of their lives.[10] The answers to three of the questions are particularly important for my considerations, and I shall provide a brief formulation of them here. For purposes of analysis, they will be referred to as question X, question Y and question Z:

X: What do you like playing with? Now and in the past? Why?

Y: Have you ever made or built anything? With what? Have the people you live with ever helped you/shown you how to make or build anything?

Z: Do you know how a motor-car works? How did you find out?

My underlying concern here was derived from the reading of Vygotskii which I have already developed: perhaps there are fundamental social-historical structures which are mediated to the child and come to be the structures of her cognition.

These interviews were also taped, and transcripts prepared for analysis (for examples, see Appendix 2). Typical reports of subjects in each sample were then identified, as well as particularly interesting reports of a low frequency, within the general ethogenic analytical framework, which as we have seen is founded on the assertion that a person's accounts correspond to her actual social activity because they are grounded in the same social life-world.

Results

In the first part of the research, there was a strong indication of substantial differences between different communities with regard to their attainment of formal operations. Table 4 is a summary of the findings based on the performances of all 40 subjects on the three different Piaget tasks. Now within the qualitative concerns of this research, the discrepancies revealed are particularly important tendencies, which I shall deal with shortly. But there is a further means of demonstrating the significance of the findings here: the reader will recall that I said earlier that

Table 4 : Number of children in each sample whose performance was classified as evidence of formal operational thought

	A FARM SCHOOL n=10	B MMATLHAME HP n=10	C TEMBA PRIMARY n=10	D ST JOHN'S n=10
SERIATION TASK	0	0	6	10
CONSERVATION TASK	0	0	4	10
CLASSIFICATION TASK	1	0	7	10

"if there is some way that we can find some support for the hypothesised typicality of the small samples," then the qualitative research design utilised here is that much more effective. This support comes from computation of probabilities, derived from the normative features of a binomial distribution, that the tendencies within the nominal data revealed by Table 4 are typical of the subject populations as a whole. The binomial probability test (cf. Runyon and Haber, 1977, p. 324) indicates that we can expect that at least 80% of the population fromwhich sample A was drawn ($p < 0,05$) would show no evidence of formal operational thought, and likewise for the population from which sample B was drawn ($p < 0,05$). On the otherhand, the same test indicates that we can expect that at least 80% of the population from which sample D was drawn ($p < 0,05$) would show evidence of having obtained formal operations. No similar predictions are possible for sample C, but perhaps this in itself is significant. Given that it is the extremes of performance in the other samples which made this statistical certainty possible, it seems reasonable to believe that the subject population from which sample C was drawn is more "middle-range" in character. So on the whole it can be said that the stark

contrasts revealed by Table 4 are representative of general contrasts between the populations from which samples were randomly selected. So I can proceed with a more qualitative examination of Table 4 with some confidence that my findings approximate the overall realities of cognitive development in South African society.

Statistical analyses using the chi-square test confirmed the overall hypothesis that cognitive developmental levels were dependent on the particular social grouping from which the subjects were drawn. The degree of dependence of the four samples and the presence/absence of formal operations for each of the seriation, conservation and classification tasks was examined. The relationship was in each case found to be highly significant ($p < 0,01$).

Table 4 seems to contain prima facie evidence that there was a marked difference between the rural children (A and B taken together) and the urban children (C and D taken together). Statistical analysis using the chi-square test confirmed this too. A significant relationship between urbanisation and the presence of formal operations in the children was discovered ($p < 0,01$).

No significant differences between the two rural samples (A and B) was discovered with regard to cognitive developmental levels ($p > 0,05$), but a significant relationship within the two urban samples between class (or as I have characterised this, "township" versus "city") and formal operational thought was discovered with the last of the chi-square analyses ($p < 0,01$).

As Roscoe (1969) points out, the chi-square test of independence identifies only that a significant relationship is present, and does not specifically identify the differences between two groups (p. 259). So having established that there are statistical relationships, we must return to Table 5 to discover what their substantive significance is: there is obviously strong support for the hypotheses that there are substantial differences in the attainment of formal operations between (i) rural and urban children, and (ii) working-class township children and middle-class city children.

With regard to individual subjects' performances on the three Piaget tasks, the details for samples A, B and D are obvious from Table 4, and Table 5 provides a breakdown of performances of the 10 subjects in sample C. Subjects 2 and 7, and subjects 4, 6 and 9 provide an important contrast, but none of the findings of

Table 5 : Performances of individual subjects in sample C (Temba Primary) classified as evidence of formal operational ability

	1 JM	2 SM	3 TV	4 Liz	5 PM	6 Tebogo	7 LK	8 MM	9 AM	10 RN
SERIATION TASK	•		•	•		•		•	•	
CONSERVATION TASK			•	•		•			•	
CLASSIFICATION TASK	•			•	•	•		•	•	•

the current research can shed any light on this, and I simply mention it here as one of the grey areas of my research.

Turning to the second part of the research, Table 6 is a summary of the most typical, and in a few cases the most interesting, accounts offered by children of their social lifeworlds. Applying the methodological notions of ethogenics, it becomes clear that there is a radical difference in the way the social world is mediated to the rural children (samples A and B) on the one hand and the urban children (samples C and D) on the other. Responses to all

Table 6 : Typical reports of subjects in response to questions concerning their socialisation (Figures in brackets refer to the number of subjects who responded in the same or equivalent way to the question)

SAMPLES	QUESTION X	QUESTION Y	QUESTION Z
A FARM SCHOOL	"playing with a ball" (10) "playing soccer" (7) "playing with water" (2)	"made food" "mother/grand-mother showed me" (9) "made house with my brother" "using branches and sand"(3) "made weapon with sticks"(6)	"no" (8) "the machine pushes it like a horse" (1) "the farmer sits in it" "I can see" (1)
B MMATLHAME H P	"playing with a ball" (8) "playing soccer" (4) "playing with stones" (9) -the children in Mahubane seem to have a game similar to marbles which they play with stones. "playing with food tins and boxes" (3)	"made a place for the cattle with my father and brothers" (4) "I make the meals" "mother/sister helped me" (8) "I dont make things" (4)	"no" (7) "engine drives it" (3) "I dont know why" (2) "my father told me" (2)
C TEMBA PRIMARY	"playing soccer" (6) "used to play in sand" (5) "play netball" (3) "playing with dolls" (5) "sewing things" (4) "reading books" (2)	"made doll" (3) "built playhouse - father/brother helped" (4) "made car with wire, wood and tin for wheels" (3) "made gun with wood" (4)	"no" (2) "yes - the engine makes it go" (7) "petrol makes it go" (5) "have seen people fix cars"(5) "see at the petrol station"(4)
D ST JOHN'S PREPARATORY	"sports equipment, for cricket or tennis - also soccer balls" (8) "Monopoly, or Cluedo" (5) "Lego and things like that" (5) "bicycle" (6) "toys" (10)	"built a house/car with Lego - by myself" (5) "made plastic aeroplanes/models - father helped" (4) "made roads for my cars"(3) "I built a zoo" (1)	"yes" (10) "its got an internal combustion engine" (4) "pistons go up and down" (5) "read about it in books" (7) "I have looked at my father's car" (10) "he showed me" (6)

the questions indicate a clear dichotomy between their respective preoccupations: the tendency is for the rural children to engage in concrete, practical activity while the urban children tend to be involved in abstract, theoretical activity. For example, question Y shows that both sets of rural children make things as part of everyday, productive activity - they learn by learning to work - whereas their urbanised counterparts make things in a way which is representative of a world outside of their immediate, everyday lives. We might say that the social relations which structure the everyday lives of both the farm school and the Mahubane children are material conditions within which survival, and hence concrete activity, is paramount. This is borne out by some examples of the elaborations children gave of their answers:

> I must help my mother. There is too much cooking to do (Sample A).
>
> It was winter, and another house was needed (Sample A).
>
> I don't make things like that (referring to a question about toys) - there is too much to do (Sample B).
>
> All the children must cook (Sample B).

On the other hand,the Temba children made a number of things outside of the necessary practical activity of their everyday lives, although they still relied on materials available in their immediate environment to do so:

> My father cannot buy me toys. So I make them with my friends (Sample C).
>
> All the children here make this kind of car because we cannot buy one (Sample C).

And the St. John's boys confirm the impression that there is a

dichotomy between abstract activity and concrete activity which parallels the urban-rural split, and at the same time show important differences from the Temba children. The materials which they used to make things tended to be toys bought for them by their parents rather than materials immediately available from their environments:

> Most kids have got Lego sets (Sample D).
>
> My father brought me a whole lot of animals which I made cages for (Sample D).

So question Y reveals a particular set of tendencies: the activities of rural children tend to be concrete, while those of urban children tend to be abstract; and within the urban situation, working-class children tend to be active within a much more immediate and rudimentary material environment than their middle-class counterparts.

The answers to questions X and Z seem to support this impression. Z reveals that the abstract understanding of the workings of a motor-car is much more accessible to children in samples C and D by virtue of the opportunities they have to discuss and experience the abstract concepts involved:

> They look inside the engine when the car won't go (Sample C).
>
> My father drew a picture for me of the way the engine works (Sample D).
>
> I saw this funny thing at the garage, and then my dad told me that it was a piston, and told me how it worked (Sample D).

For the rural children this knowledge is almost defined out by their very concrete existences. So for the most part motor-cars are unknown because they are not engaged in, so to speak, and those that do have any knowledge of them have it only in a sketchy

or intuitive way. Question X supports this argument in an interesting manner: the rural children tend to play with things that are either very simple in concept (a ball) or else are very much part of the material, concrete universe around them, whereas their urban fellows play with toys which are conceptually complex and often derive or originate from places outside of their immediate environs.

Turning to the differences between Temba pupils and St. John's pupils as revealed by X and Z, there is also a tendency for the everyday activity of the former to be more concrete and that of the latter to be more abstract. The St. John's boys are clearly consumers in a technological world, so much so that the games they play, the toys they have access to, and even their thoughts on motor-cars and the like, all consist in a highly abstract relationship to the world. The manufacture and acquisition of commodities takes place outside of their immediate, concrete lives. While the Temba children are clearly much more like this than the two rural samples, their lack of direct access to expensive toys, motor-cars and other commodities means that they are not as "removed" as their private school peers.

To attempt to capture the differences which Table 6 reveals in a few words: I think that we can say of the farm school children and Mahubane children that concrete activity structures their social world, while the opposite is true for the St. John's children. Abstraction structures their universe. The Temba children's experience tends in this latter direction as well, but still exhibits

certain features of everyday concrete activity.

A word about the remaining substantive question put to subjects in the second part of the research is necessary. The children were asked to describe a typical day in each of their lives (see Appendix 1), but besides the uniform comment along the lines "I go to school," no substantial differences emerged which have not already been captured in the answers to X, Y and Z. Consequently, these reports were disregarded.

Discussion

I shall confine myself for the remainder of this chapter to the immediate concrete issues which the evidence I have presented here throws up, and leave for chapter five the more fundamental, but more abstract, theoretical issues which can be brought to bear on this material. Chapter five will also set out a retrospective evaluation of the research, and a few words of self-criticism.

The first point to be made is that these findings provide strong support for the two related hypotheses that made up the empirical problem with which this research was concerned: (i) urban children do tend to show a higher incidence of formal operational thought than their rural peers, and (ii) middle-class city children do tend to show a higher incidence of formal operations than working-class children in the townships. This is consistent with general trends in Piagetian research which show that there is a cross-cultural "lag" in the cognitive development of children. It is the rural farm workers' children and bantustan children who seem to

be furthest from acquiring propositional logic, and affluent middle-class city children represent the pinnacle of formal operational thought. Somewhere in between these two, but also tending to have a significant formal operational ability, we find the cognition of working-class township children.

In the second place, we have seen that there are radical differences in the material conditions of the four subject populations with whom this work was carried out. The two rural samples are representative of the most extreme conditions of poverty, while sample D can be said to be the mirror image of this. Once again, the Temba children come from a community which is somewhere between these two extremes, although still relatively poverty stricken.

Finally, this evidential pattern repeats itself in the findings of the latter part of the research, that is, in the nature and structure of children's everyday experiences, activities and socialisation. Sample D children reveal the most abstract lifeworld structures, and the two rural samples the most concrete; the Temba children, needless to say, are somewhere in between. And we have seen that the conditions and consciousness revealed by Table 6 are rooted in the overall social relations of production as manifest in the various communities. The expensive books, toys and equipment, as well as the amount of leisure that characterises their lifestyle, are things which the children in sample D have access to by virtue of their affluence. The Temba sample, C, is exposed to less sophisticated toys, and less absolute leisure time, because it is drawn from a poorer urban community. At the other end of the spectrum,

the stark poverty of the rural samples is reflected in the daily struggle for survival and its expression in concrete, production-oriented activity.

So there is a strong suggestion of a relationship between the structures of society and those of cognitive development. The evidence discussed here suggests that there is an explanation of the differing attainment of formal operations by different groups of South African children (Table 4) to be found in their everyday experiences, activities and socialisation (Table 6). The premium placed in urban children's lives on abstract activity means it is likely that they will develop formal operational abilities quickly; the domination of abstraction in the private school pupils' lives accounts for their faster cognitive development in relation to the Temba pupils, whose activities are abstract, but still more concrete than theirs, and the practical nature of the rural children's lives probably explains why their thinking is concrete operational in character.

The overall construction of cognition, and cognitive development, within the total social formation seems obvious. The dominant structures of social production, and the conditions of poverty that they tend to structure into the lives of rural and working-class South Africans - inadequate housing, health care, education, resources, etc., - produce an emphasis on practical, concrete activity, which to a greater or lesser degree militates against the development of abstract logical operations in children's thinking.

The extent to which genetic epistemology can handle this reality is the major concern of my concluding chapter.

CHAPTER FIVE

CONCLUSIONS

> Buck-Morss: The question is whether in Piaget it makes any difference whether the object is a mother or a table ... For the epistemic subject, it would not make a difference. Is the epistemic subject simply a myth that Piaget invents and uses simply because it works?
> Furth: All scientists invent their own perspective and then forget everything else. There is no other way of using our intelligence. (Faculty seminar, 1980, p. 52)

In the preceding argument the foundations have been laid for an analysis of the theoretical adequacy of Piaget's genetic epistemology in explaining the acquisition of knowledge by children. The central question which has been developed is whether the theory, in its emphasis on the structures of cognition, takes proper account of the social construction of knowledge. The task of this concluding chapter is to attempt to provide an answer to the many levels on which this problem presents itself, and it proceeds as follows: initially, I examine the empirical realities which give rise in the first place to this problem of content - as I have developed them in the previous chapter - and comment of some of their strengths and weaknesses as a starting point for this theoretical analysis. Secondly, I attempt to locate the problem within its various levels of abstraction, and thus to reach some kind of conclusion about Piaget's contributions and their implications for South African psychology. Finally, the chapter says something about

further research which this work necessitates.

One contention of this thesis has been that the existence of cross-cultural and cross-class cognitive "lags" is necessary, but not sufficient, to constitute a problem of content in Piaget's theory of formal operations. Put differently, we might say that these variations are in themselves a minor anomoly in Piaget's universalist aspirations, but only become a serious challenge to his theory when articulated within a theory which is more inclusive of the social than is genetic epistemology. Nevertheless, they are the starting point for this broader theoretical questioning, and it will help here to examine the adequacy of the conclusions reached in chapter four in this light.

In a footnote to the previous chapter (see ch. 4, footnote 4) I indicated that my research ignored the gender and race of the subjects who participated in it, and that there are certain conceptual problems with this in analysing cognitive development under apartheid. The criticism which is pertinent here is that the research did not take account of the material relations of race and gender which are so crucial to the divisions which structure South African life. Although I remain convinced that "race" and "sex" (just as much as "individual differences"), when conceived of in positivist terms as "variables", are irrelevant to the structuralist discourse of genetic epistemology, it seems that there is a weakness along these lines in the research. So while comparison of, say, an all-white, all-male sample (St. John's boys) with an all-black, mixed-gender sample (Temba pupils) reveals important and significant

differences for a consideration of Piaget's claimed universalism, it still leaves certain crucial determinants of these differences out of the picture.

Related to this is another possible criticism of my research: the depth of social and cultural groupings in South Africa is much much greater than the four samples used can be understood to represent. Although they do capture the diversity, or the breadth, of these differences as they are manifest in this country, doubts still exist about the nuances and subtleties which research with Afrikaans working-class white children, or so-called "coloured" children, or religious Muslim children, to take but a few examples, will inject into the considerations which I deal with here.

The last retrospective point to be made about the empirical level of the research stems from Margaret Donaldson's (1978) extremely perceptive criticisms of Piaget's methods. She argues that what Piaget tasks reveal in young children is not so much an inability to think in abstract terms, but rather an inability to comprehend the complex linguistic forms in which those problems are articulated. Now the research I carried out proceeded on the assumption that the use of the subject's home language would eliminate any of the linguistic problems which so often constitute gremlins in Piagetian research; but subsequent discussions with colleagues,[1] as well as Donaldson's book, have raised doubts in my mind about whether these issues were accounted for in the way the Piaget tasks were applied. I can do no more than raise a question about them here.

Now all of these criticisms are related in the sense that they are about the material structures of cognitive development under apartheid, and each poses questions which, when answered, will greatly develop our understanding of the development of children in this country at the present conjuncture. Nevertheless, the failure of the research to incorporate these questions adequately by no means negates its value as a concrete starting point for consideration of Piaget's thesis. There is no doubt that it establishes that there are structural differences in cognitive development across different cultural and class groupings in South Africa, and it also strongly suggests that these differences have their origins in these material differences in social structure.

It thus becomes possible to say to what extent my arguments have provided solutions to the two most concrete formulations of the central problematic of this thesis - the problem of content in Piaget's account of formal operations - as I demarcated them toward the end of chapter three. On an empirical level, it should be clear that the problem has real foundations in the cognitive "lags" established by my research. And with regard to questions concerning cognitive deprivation under apartheid, half an answer has been provided. Clearly, the material inequalities and oppression experienced by most South Africans hampers the possible development of abstract cognitive abilities by structuring into their lives what I have termed "the social relations of underdevelopment." The socio-economic link to concrete operational thought is clear, but it is the cultural and ideological consequences of apartheid for forms of cognitive structure which have remained outside the scope of this

thesis. Earlier I indicated the necessity of investigating the material cognitive relations of gender and race, and I am sure that part of this answer will come into view there. But leaving aside these unanswered questions, my arguments thus far have clearly established that certain communities, particularly those in the rural areas, are so fundamentally underdeveloped and epistemologically retarded by the harsh social divisions of apartheid that abstract operations are seldom part of their cognitive life-worlds.

However, none of this in itself establishes that there is a flaw in Piaget's theory of formal operations; his theory is quite capable of incorporating these concrete, empirical instances of differences in cognitive operations, and of providing an account of them in its own terms. The terms in which this abstraction takes place remain, as we have seen, a recapitulation of the fundamental biological structuralism that is genetic epistemology: Piaget handles the evidence by affirming the universal necessity of a sequence of stages in cognitive development, and comes to relativise the ages at which cognitive transformations should ideally occur. He continues to regard social content as peripheral to the motive force of cognitive development.

Vygotskii, on the other hand, appropriates the same empirical evidence within a different theoretical account, and thus locates forms of cognitive structure within overarching forms of social relations. Social content, in this view, is at one and the same time the dynamic basis of both cognitive and social structures.

And this is radically incompatible with Piaget's dualist psychology, as has been established previously.

So there is no empirical basis on which we can decide between the competing cognitive development theories of Piaget and Vygotskii. Both are realist theories which rely on a similar method of abstraction to construct their theoretical claims, but the substance of those claims comes from opposed epistemological and ontological commitments. Neither believes, in positivist terms, that it is the data and its statistical description which constitutes the truth (knowledge). So the problem is one of ascertaining which theoretical position better appropriates the real structures of cognition, as they are reflected in the observed, empirical material.

In order to lend more clarity to these issues, let me restate the argument in the context of the evidence revealed by the second part of my research. What this evidence indicates is that communities whose everyday activity is concrete in form tend to be those communities in which children's cognitive development has not gone beyond concrete operations by age 12, while communities characterised by abstract activity tend to be those which produce children with abstract formal operations at this age. Now Vygotskii's theory incorporates this evidence easily into its notion that cognitive structure is itself social structure, while not losing sight of the historical fact that all societies move more and more towards abstract forms of life as they develop their forces of production. But Piaget is also able to offer an explanation of this phenomenon. For him, non-western societies do show indications of a slower rate

at which children mature cognitively, but this is not a central concern in his account of the acquisition of knowledge. His work with children is always part of the larger enterprise of developing an overall theory of the evolution of human knowledge, and consequently his central thrust remains a biological, ontogenetic account of cognitive development. Cross-cultural differences in cognitive ability are thus not deemed by Piaget to be of central significance in explaining the origins of knowledge in the child, and this has the unfortunate consequence that he does not really explain why they occur. Now this might well be a weak area within his terms of reference, but it is not inevitably a negation of those terms. So both Piagetian and Vygotskiian psychology can deal with the empirical level of cross-cultural "lags" in cognitive attainment, even if the former does so somewhat inadequately.

However, it is on the more abstract theoretical levels of analysis that we can discover a serious flaw in genetic epistemology, which is that it does not take sufficient account of the role of social content in the construction of a child's cognition. It is not enough to say, in response to an epistemological challenge that Piaget exhibits an unacceptable social "blindness", that any science asks only particular questions and hence leaves many issues unaccounted for (as Furth does in his exchange with Buck-Morss which is recorded at the outset of this chapter). The challenge is that Piaget's epistemology is inadequate qua epistemology, because knowledge is by definition generated in social structures.

I do not need to repeat in detail the important arguments of Buck-

Morss, the neo-structuralists and the Wittgensteinians which I set out in my third chapter, but all have a direct bearing here. It seems to me that there can be very few grounds to support a thesis of the epistemological primacy of the individual organism, which we have seen that Piaget's notions rest upon. Knowledge can only be said to exist once there is the establishment of real objective agreement between people in a social situation, and to conceive of it as the product of a single human being is absurd. The existence of abstract operations in children in many different situations is not in itself evidence of a universal internal cognitive motor in all children, but Piaget's dualist concerns lead him to start with this misconception. In fact, the general existence of formal operational cognitions (abstract representations of reality in peoples' minds), if we are to make any sense of the acquisition of knowledge in the real sense of the term, must presuppose the existence of historical social imperatives which produce abstract socio-economic and ideological structures in everyday life.

Piaget's failure to incorporate an adequate conception of knowledge seems to derive from the central thrust in his work, which as we have seen is a concern to build a theory of the evolution of human knowledge. It leads him to conceive of mathematics as the evolutionary pinnacle of human knowledge, and hence to treat formal operations as the universal pinnacle of all human thought. This must produce a biological model of the development of any child's cognition.

But while Piaget's enterprise as a theorist of evolution might

well be sound, the psychology which it produces rests on a questionable idea of the nature and source of human knowledge. It seems to be impossible to account for the prevalence of abstract operations in technological social formations, and the dominance of concrete operations in isolated, pre-technological social life, simply by reference to the unfolding of biological structures within certain social boundaries. In this sense, Vygotskii provides a much more adequate appropriation of the real structures of cognition: his insight that certain forms of cognitive structural change take place socially, with no corresponding biological or neurological transformations, operates with a more correct notion of knowledge than that employed by Piaget.

The evidence of the second part of my research takes on much more significance on the strength of this theoretical clarification. If we are to employ the concept of knowledge accurately, then the strong relationship between cognitive structure and social structure which was discovered is evidence in support of the kind of conception of child development developed by Vygotskii. Piaget must, I think, remain theoretically oblivious to the central import of the evidence because his concept of knowledge confuses different types of experience with one another. Buck-Morss is correct: tables and mothers are not in the same category. The latter is a crucial mediator of social life to the child and hence a constitutor of knowlege for her.

One final point is helpful in developing this part of the argument: Piaget exhibits much the same weakness as that demonstrated by

Feuerbach, that is, the location of social processes in individuals as if they are natural processes. The contention here is that the social construction of knowledge should be restored to centre-stage. Buck-Morss "does a Marx" on Piaget which is able to turn his (biological) universalism on its head, and show that his account of formal operations is itself a product of the social structures of abstraction which it seeks to explain in the first place:

> For he is no more divorced from interaction with the objective world than are the children in his experiments. The truth of his theory emerges precisely when ... it failed, that is, not by establishing a universal psychology, but by accurately, if unintentionally, reflecting the structure of his own society. (Buck-Morss, 1980, p. 105)

So, says Buck-Morss, Piaget's "tests", when conducted within his theoretical framework, operate as self-fulfilling universalist prophecies.

Thus, my argument has been that Piaget's theory exhibits a problem of content in the account it provides of formal operations. By failing to incorporate the contents of cognition into his account of structure, he leaves aside the crucial determinants of human knowledge. On a theoretical plane, the debate would seem to resolve itself in Vygotskii's favour.

However this does not mean that Piaget's theory can be dismissed out of hand. Firstly, the issues raised here are but a small scratch on the huge theoretical edifice which Piaget built throughout his lifetime, and it would be presumptuous to fail to recognise the rigour which went into it. And secondly, a great deal more

research is required, both into formal operational thought and all the other stages of cognition which Piaget speaks of, before any problem of content in his theory can be firmly established. Something like a research programme on many different levels is in fact indicated. The comments I made earlier about the need for much more rigorous fieldwork to determine cognitive developmental differences under apartheid are to the point here: another function of this research would be to establish relationships between social structure and cognitive structure at all levels, and to provide a foundation for the theoretical development of our understanding of Piaget's contributions.

Some of the specific research questions which such a programme would throw up are the following:

1) Is there a relationship between dominant social relations and the cognitions which Piaget identifies as being typical of sensorimotor and preoperational thought? Is it only operations proper which can be said to be embedded in social relations?
2) In which communities in South Africa do concrete operations dominate? In which communities do formal operations dominate?
3) What is the full extent of the relationship between the poverty and oppression produced by apartheid and the psychological development of children under those conditions?

And there are many similar questions to be investigated. If this thesis stimulates a number of researchers to take up these issues, then most of its work has been done.

On a more abstract level, the relationship between culture and cognitive development needs a much more thorough investigation than has been possible in this work. My treatment of the terms "culture" and "cross-cultural" here has in fact been quite dangerous: in a nation where "culture" is one of the prime ideological tools in the state's divide and rule strategies, one should either use the term "culture" rigorously, or not use it at all. And this is also the reason why this work must be done properly in the South African context, with regard to cognitive development and to all other forms of psychology.

Needless to say, all this work needs to take place within an awareness of the contested epistemological ground that demarcates developmental psychology. Piaget and Vygotskii represent important centres of coherence within the confusion that often abounds in psychological research, and positions can be worked out with respect to the debate between them. My arguments in this thesis have suggested that Piaget perhaps does not take material social relations sufficiently into view, and that Vygotskii poses an important challenge to genetic epistemology in this regard. But I have also indicated that Piaget's theory provides very important insights for our understanding of developing children, and the theoretical task which comes out of this thesis is to attempt to understand his huge efforts within a more adequate conceptualisation of the acquisition of knowledge than he is able to offer.

The suspicion that I am left with at the end of this thesis is that

it might be possible to develop a materialist reading of Piaget's genetic epistemology, one which would dispense with the biologism in his work and which would locate formal operational thought in its proper social context.[2] This is the starting point with which this thesis leaves me, the next "itch" that I must attempt to "scratch."

FOOTNOTES

INTRODUCTION

1. Thanks to James Moulder for this rather nice conception of what it is that one does in something like a thesis.
2. As a theory of evolution, Piaget's theory must surely not conceive of formal operations as the inevitable pinnacle of human thought ?
3. See the edited collections: Bruner et al. (1966), Berry & Dasen (1974) and Price-Williams (1969).
4. Two important exceptions to this charge are Donaldson (1978) and Bryant (1974), both of whom claim that Piaget is incorrect in his belief that very young children are incapable of formal operations. However, neither of them are theorists who concern themselves with the problem of social content in Piagetian psychology, and they are peripheral to the central thrust of the thesis.
5. See Luria (1976a & 1976b). The original writings which report on this work are in Russian, and hence inaccessible to myself.

CHAPTER ONE

1. As Ginsburg & Opper (1969) point out, there is some confusion about terminology here. I use the term "schemata" to refer to the operational units which make up a total cognitive structure (sing. "schema").
2. For a more adequate statement of this argument, see Moll (1983).
3. Thanks are due to Wally Morrow for drawing my attention to this.
4. See Morrow (1982) on this issue. He finds a fundamental contradiction in Piaget here, based on his inability to reconcile the monist philosophy of life of one of his mentors, Bergson, with the dualist philosophy of the other, Kant. Importantly, the monism referred to here is a biological monism, and as such is not equivalent to the dialectical materialist monism which informs the work of Vygotskii.
5. For an excellent account of this, see the first four chapters of Hamlyn (1978).
6. Bergson's monism does not seem to be a coherent philosophy of mind. See 4 above.
7. For an excellent account of realist philosophy of science, see Bhaskar (1979).
8. As far as I am aware, Piaget does not refer to his method as abstraction, but he certainly uses the term to characterise the acquisition of knowledge which his method is surely an instance of. In Adaptation and Intelligence, he argues that "reflecting abstraction", which "arises in the very activities of the subject" (1980, p. 90), is the means whereby we construct knowledge on the basis of an initial, and superficial, "empirical abstraction". His realist leanings are clear here.

CHAPTER TWO

1. For a more adequate account of these issues as they pertain to psychology and questions of consciousness and subjectivity, see Molina (1976).

2. One important contemporary version of this debate consists in a level of the raging dispute between Althusser and E P Thompson about the role of theory in historiography, which is well known to social scientists.

3. It is true that monkeys are much more cognitively sophisticated than bees, and that the problem is a bit more complicated than Marx would have it. But the distinction between animals and human beings on the grounds that only the latter possess conscious, creative labour is still an important distinction, although it is problematic - see Midgley (1980) on this issue.

4. Stalin's "one-way" economic determinism is often referred to as "vulgar Marxism" by contemporary Marxist theorists.

5. Important questions about the distorted construction of masculine and feminine cultural forms are raised here. In a situation where mothers tend to be responsible for most child-rearing, Vygotskii might well have argued that sexual inequalities are structured into the developing cognitive structures of young children.

6. Indeed this is the most important factor in Vygotskii's "three-factor theory" of cognitive development in children. The other two have to do with the influence of maturational and environmental factors.

7. The ZND is also referred to in Vygotsii's writings as the ZPD (zone of proximal development) e.g. Vygotskii (1978).

8. Vygotskii's theory is not an "ages and stages" theory in the same sense that Piaget's is.

9. Indeed, Leontiev & Luria (1968), themselves giants in the field, recognise Vygotskii as "the founder of neuropsychology".

CHAPTER THREE

1. The terms "inside-out" and "outside-in" to characterise cognitive development theories are borrowed from Jerome Bruner. See Bruner et al. (1966, ch. 1).

2. Vygotskii's editor points out that Vygotskii's criticism of Piaget is based on Piaget's early works, and is hardly applicable to the later Piaget. I would agree - there is a tendency in Vygotskii to read too much of the positivist into Piaget here. Nevertheless, his criticism of Piaget clarifies important features of the dispute between the two.

3. I have recently become aware that the MIT Press in Boston has published a pamphlet by Piaget in which he specifically answers the criticisms directed at him by Vygotskii in Thought and Language. However, I have been unable to locate this in time to consider it in this thesis. Presumably, Piaget defends himself in it much as one would expect him to, that is, by reaffirming his essentially biological conception of knowledge.

4. One popular conception of the way in which this work should be done is to isolate the compatible surface features of both the theories and then to argue for a synthesis in practice between the two (see Segal, 1982). However, this conveniently ignores the radical incompatibility of the two positions when considered in their totalities, and it can only produce unsound and even harmful psychological practices.

5. I have avoided arguments that have been posed from within certain forms of Marxism that these states are actually founded on a form of "state capitalism". But on the whole, they do demonstrate different economic structures which still pose this problem for Buck-Morss.

6. This is not to say that there are no differences in the cognitive structures engendered under capitalism and socialism, but only that it is naive to believe that these differences follow the abstract-concrete split, which must surely be the absurd outcome of Buck-Morss' position if it is pushed on the matter.

7. I think that this is true despite differences in Lukács' Marxism, which informs Buck-Morss, and the Marxism-Leninism which informs Vygotskii.

8. This gives rise to the problem of Piaget's structuralism. Piaget (1971c) is happy to include himself, along with thinkers such as Levi-Strauss, Lacan, Barthes and Foucault, in the mainstream of European structuralism. But it is true that his essentially biological structuralism differs from the linguistic structuralism of the latter thinkers, who ground their work in the structural linguistics of Jakobson, and most collections on the structuralist movement do not include consideration of Piaget.

9. The neo-structuralists whom I deal with here all claim dialectical materialist parentage, and their contributions are easily theorised in Vygotskiian terms. Hamlyn, however, is a more interesting case: his theoretical home, if it can be considered to be one in the same sense as Marxism or genetic epistemology is one, lies in British analytical philosophy, which is concerned to analyse the use and meaning of the everyday activity of language. Now it seems to me that Marxism is also centrally concerned with language as a practical activity, and Vygotskii especially so, and this extends to the theoretical analysis of the language used by, say, Piaget. In this sense, Hamlyn's insights into Piaget seem to enrich the critique that Vygotskii develops of genetic epistemology.

10. Note that I am referring to the formulation of hypotheses in the non-positivist sense of the term, that is, as expressions of tendencies in the material universe rather than as nomological statements linking variables to one another.

CHAPTER FOUR

1. This leaves aside questions about whether these methods are appropriate at all to the investigation of psychological questions. There are numerous conceptions of scientific practice which would say not.

2. See chapter one, footnote 7.

3. The material realities of apartheid, in a somewhat harsh manner,

also made the distinctions which I worked with in the research relatively easy to determine on the ground. For example, the rural-urban division has been viciously drawn by influx control legislation and the Farm Labour Act, and it is currently being tightened up by the Orderly Movement and Settlement of Black Persons Bill, currently before Parliament. And the Group Areas Act and related legislation has created clear demarcations between working-class township people and middle-class people. So the repression of apartheid made it that much more possible to find single schools which were representative of only one of the many different communities which make up this country.

4. I can already anticipate one line of criticism which might be levelled here, that is, that I have failed to control the variables of sex and race in the selection of my samples. But this criticism is misconceived: Piaget's discourse does not incorporate considerations of this kind, and to speak of racial and gender differences within the theoretical terms of genetic epistemology makes no sense. However, there is a certain level on which this is a problem: if the material relations of race and gender in South African society have a serious implication for cognitive development in children (and I think that there is no doubt about this, at least in the first case), then any researcher ignores this at her peril. In retrospect, it seems that there is a weakness in the way I selected the samples here, but it is not a weakness that invalidates the findings arrived at by working with them. And if it is a weakness, then it is also a weakness in Piaget's discourse in the South African context.

5. Since I was at this farm school without the permission of the farmer who owned that farm, the teachers there asked me to preserve their anonymity. The farm school must thus remain nameless.

6. One possible problem with this assumption is the strong sense that one has that schooling for blacks in South Africa amounts to "gutter education", as the children themselves labelled it in the boycotts of 1980.

7. In the same way that Furth thinks that there is no such thing as a Piaget "test", it is probably absurd to talk of Piaget "apparatus". The APA publication manual reveals its epistemological biases once again.

8. In fact, the initial plan was to use a lion, a hippo and an elephant in place of the ant, spider and fly, but this was changed on the advice of one of the farm school teachers.

9. "Children in the concrete operational stage have the following logical capacities:
Compensation: To mentally hold two dimensions at the same time in order to see that one compensates for the other.
Identity: ...implies conservation.
Reversibility: To mentally reverse a physical operation to return the object to its original state." (Labinowicz, 1980, p. 73).

10. There was no particular source from which any of the questions was drawn. They emerged rather from general reading and common-sense understandings of the material realities of everyday life as one might expect to find them across different South African communities.

CHAPTER FIVE

1. Thanks are due to Angie Ramarola who raised this point in a discussion I had with her.

2. A similar materialist rereading of Freud has taken place in quite a concerted way over the past ten years. So for example Mitchell (1974) reinterprets Freud's notion of Penis envy, arguing that it is a psychological state engendered in women by their interpellation into the dominant ideological structures of patriarchy, and that it has less to do with a biological organ than with the symbols which dominate in capitalist society. Her aim, like that of many other writers, is to rescue Freud from his biologism - the "Marx-Freud debate" is firmly on the agenda for any serious discussion of psychoanalysis at this point in time. I am sure that a number of useful lessons for our reading of Piaget can be learnt from these reinterpreters of Freud .

REFERENCES

Beard, R. M. An Outline of Piaget's Developmental Psychology. London: Routledge & Kegan Paul, 1969.

Bergson, H. Creative Evolution. New York: Random House, 1944.

Berry, J. W. & Dasen, P. R. (Eds.) Culture and Cognition. London: Methuen, 1974.

Blignaut, S. Statistics on Education in South Africa. Johannesburg: SAIRR, 1981.

Bhaskar, R. The Possibility of Naturalism. Hassocks: Harvester, 1979.

Boden, M. Piaget. Glasgow: Fontana, 1979.

Bogdan, R. C. & Biklen, S.K. Qualitative Research for Education. Boston: Allyn & Bacon, 1982.

Bovet, M. Cognitive processes among illiterate children and adults. In Berry, J. W. & Dasen, P. R. (Eds.), Culture and Cognition. London: Methuen, 1974.

Bruner, J. S. Inhelder and Piaget's "The Growth of Logical Thinking": a psychologist's viewpoint. British Journal of Psychology, 1959, 50, 363-370.

Bruner, J. S., Olver, R. & Greenfield, P. (Eds.) Studies in Cognitive Growth. New York: Wiley, 1966.

Bryant, P. Perception and Understanding in Young Children. London: Methuen, 1974.

Buck-Morss, S. Socio-economic bias in Piaget's theory and its implications for cross-culture studies. In Riegel, K. F. (Ed.), The Development of Dialectical Operations. Basel: S-Karger, 1975.

Buck-Morss, S. Piaget, Adorno and the possibilities of dialectical operations. In Silverman, H. J. (Ed.), Piaget,

Philosophy and the Human Sciences. Brighton: Harvester, 1980.

Buss, A. R. Theories of cognitive development: Piaget,Marx and Buck-Morss. In A Dialectical Psychology. New York: Irvington, 1979.

Dasen, P. R. Cross-cultural Piagetian research: a summary. Journal of Cross-Cultural Psychology. 1972, 3, 23-40.

Donaldson, M. Children's Minds. Glasgow: Fontana, 1978.

Easley, J. A. Comments on the INRC group. In Ripple, R. & Rockcastle, V. (Eds.) Piaget Rediscovered. Ithaca: Cornell University, 1964.

Engels, F. Anti-Dühring. New York: International Publishers, 1939.

Faculty seminar on the concept of structure in Piaget's genetic epistemology. In Silverman, H. J. (Ed.), Piaget, Philosophy and the Human Sciences. Brighton: Harvester, 1980.

Feuerbach, L. The Essence of Christianity. New York: Harper & Row, 1957.

Flavell, J. H. The Developmental Psychology of Jean Piaget. New York: Van Nostrand, 1963.

Furth, H. Comment in discussion reported in Silverman, H. J. (Ed.), Piaget, Philosophy and the Human Sciences, Brighton: Harvester, 1980.

Ginsburg, H. & Opper, S. Piaget's Theory of Intellectual Development. Englewood Cliffs: Prentice-Hall, 1969.

Hamlyn, D. W. Epistemology and conceptual development. In Mischel, T. (Ed.), Cognitive Development and Epistemology. New York: Academic Press, 1971.

Hamlyn, D. W. Human learning. In Peters, R. S. (Ed.), The Philosophy of Education. London: Oxford University Press, 1973.

Hamlyn, D. W. Experience and the Growth of Understanding. London: Routledge & Kegan Paul, 1978.

Harré, R. Blueprint for a new science. In Armistead, N. (Ed.), Reconstructing Social Psychology. Harmondsworth: Penguin, 1974.

Harré, R. & Secord, P. The Explanation of Social Behaviour. Oxford: Blackwell, 1972.

Harré, R., Marsh, P. & Rosser, E. The Rules of Disorder. London: Routledge & Kegan Paul, 1978.

Hegel, G. W. F. The Logic of Hegel. London: Oxford University Press, 1968.

Krech, D., Crutchfield, R. & Livson, N. Elements of Psychology (3rd ed.). New York: Alfred Knopf, 1974.

Labinowicz, E. The Piaget Primer. Menlo Park: Addison-Wesley, 1980.

Langer, J. Theories of Development. New York: Holt Rinehart & Winston, 1969.

Lenin, V. I. On Religion. London: Lawrence & Wishart, 1922.

Leontiev, A. N. & Luria, A. R. The psychological ideas of L. S. Vygotskii. In Wolman, B. B. (Ed.), The Historical Roots of Contemporary Psychology. New York: Harper & Row, 1968.

Lerner, W. A History of Socialism and Communism in Recent Times. Englewood Cliffs: Prentice-Hall, 1982.

Luria, A. R. Cognitive Development. Cambridge: Harvard University Press, 1976a.

Luria, A. R. Towards the problem of the historical nature of psychological processes. In Averill, J. R. (Ed.), Patterns of Psychological Thought. New York: Wiley, 1976b.

Marx, K. Grundrisse. Berlin: Dietz Verlag, 1953.

Marx, K. Capital (Vol. 1). London: Lawrence & Wishart, 1954.

Marx, K. Grundrisse. Harmondsworth: Penguin, 1973.

Marx, K. The holy family. In McLellan, D. (Ed.), Karl Marx: Selected Writings. London: Oxford University Press, 1977.

Marx, K. Preface to "A Contribution to the Critique of Political Economy". In Tucker, R. C. (Ed.), The Marx-Engels Reader. New York: Norton, 1978a.

Marx, K. Theses on Feuerbach. In Tucker, R. C. (Ed.), The Marx-Engels Reader. New York: Norton, 1978b.

Marx, K. The German Ideology. Extracts in Tucker, R. C. (Ed.), The Marx-Engels Reader. New York: Norton, 1978c.

McLeish, J. Soviet Psychology. London: Methuen, 1975.

Midgley, M. Beast and Man. London: Methuen, 1980.

Mitchell, J. Psychoanalysis and Feminism. Harmondsworth: Penguin, 1974.

Molina, V. Notes on Marx and the problem of individuality. In C.C.C.S. On Ideology. Birmingham: Russell Press, 1976.

Moll, I. C. Against eclectics. Unpublished seminar paper, 1982.

Moll, I. C. Interpreting Piaget to South Africa. Paper delivered to the Developmental Psychology Conference, University of Natal (Durban), 1983.

Morrow, W. E. A Critical Study of the Bergsonian Roots of Piaget's Theory of the Development of Human Understanding. Unpublished doctoral dissertation, University of London Institute of Education, 1982.

Murray, J. The Development of Spatial Concepts in African and European Children. Unpublished master's dissertation, 1961.

Piaget, J. The Language and Thought of the Child. Cleveland: Meridian, 1955.

Piaget, J. Autobiography. In Boring, E. G. et al. (Eds.), The History of Psychology in Autobiography (Vol. 4). New York: Russell & Russell, 1952.

Piaget, J. The Origin of Intelligence in the Child. London: Routledge & Kegan Paul, 1953.

Piaget, J. Development and learning. In Ripple, R. & Rockcastle, V. (Eds.), Piaget Rediscovered. Ithaca: Cornell University, 1964a.

Piaget, J. Comment in discussion reported in Ripple, R. & Rockcastle, V. (Eds.), Piaget Rediscovered. Ithaca: Cornell University, 1964b.

Piaget, J. Six Psychological Studies. London: Harvester, 1968.

Piaget, J. Piaget's theory. In Mussen, P. H. (Ed.), Carmichael's Manual of Child Psychology. New York: Wiley, 1970a.

Piaget, J. Genetic Epistemology. New York: Columbia University Press, 1970b.

Piaget, J. Biology and Knowledge. Chicago: University Press, 1971a.

Piaget, J. Insights and Illusions of Philosophy. London: Routledge & Kegan Paul, 1971b.

Piaget, J. Structuralism. London: Routledge & Kegan Paul, 1971c.

Piaget, J. Psychology and Epistemology. Harmondsworth: Penguin, 1977.

Piaget, J. Behaviour and Evolution. London: Routledge & Kegan Paul, 1979.

Piaget, J. Adaptation and Intelligence. Paris: Hermann, 1980.

Piaget, J. The theory of stages in cognitive development. In Gallagher, J. M. & Reid, D. K. (Eds.), The Learning Theory and Inhelder. Monterey: Brooks-Cole, 1981a.

Piaget, J. Problems of equilibration. In Gallagher, J. M. & Reid, D. K. (Eds.), The Learning Theory of Piaget and Inhelder. Monterey: Brooks-Cole, 1981b.

Piaget, J. Creativity. In Gallagher, J. M. & Reid, D. K. (Eds.), The Learning Theory of Piaget and Inhelder. Monterey: Brooks-Cole, 1981c.

Piaget, J. & Inhelder, B. The Psychology of the Child. London: Routledge & Kegan Paul, 1969.

Price-Williams, D. R. A study concerning concepts of conservation of quantities among primitive children. Acta Psychologia. 1961, 19, 669-670.

Price-Williams, D. R. Cross-Cultural Studies. Harmondsworth: Penguin, 1969.

Rahmani, L. Soviet Psychology. New York: International Universities Press, 1973.

Roscoe, J. T. Fundamental Research Statistics for the Behavioural Sciences. New York: Holt Rinehart & Winston, 1969.

Runyon, R. P. & Haber, A. Fundamentals of Behavioural Statistics. Reading: Addison-Wesley, 1977.

Sagan, C. The Dragons of Eden. London: Hodder & Stoughton, 1978.

Segal, D. E. Symbolic play and communication in hearing impaired children: Piaget and Vygotskii reconsidered. South African Journal of Psychology. 1982, 12(4),

Serpell, R. Culture's Influence on Behaviour. London: Methuen, 1976.

Simon, B. Karl Marx and education. In Intelligence, Psychology and Education. London: Lawrence & Wishart, 1971.

Sutton, A. A dialectical psychology of child development: some aspects and implications of Vygotskiian psychology. C.U.L. Collected Papers on Education. 1980, 26-39.

Venn, C. & Walkerdine, V. The acquisition and production of knowledge: Piaget's theory reconsidered. Ideology and Consciousness, 1978, 3, 67-94.

Vygotskii, L. The problem of the cultural development of the child. Journal of Genetic Psychology. 1929. 6. 415-434.

Vygotskii, L. Thought and Language. Cambridge: M. I. T. Press, 1962.

Vygotskii, L. Mind in Society. Cambridge: Harvard University Press, 1978.

Wason, P. C. The theory of formal operations - a critique. In Geber, B. A. (Ed.), Piaget and Knowing. London: Routledge & Kegan Paul, 1977.

Wilden, A. System and Structure. London: Tavistock, 1972.

Wittgenstein, L. Philosophical Investigations. Oxford: Blackwell, 1972.

APPENDICES

APPENDIX 1 : THE INTERVIEW QUESTIONNAIRE USED IN THE SECOND PART OF THE RESEARCH

INTERVIEWS

Follow the following set of questions, althouugh a great deal of verbal elaboration will obviously be necessary for each question:

1. Where do you live ? Have you lived there all your life ?

2. With whom do you live ? (Presumably the answer will be something like "mother & father" or "family" in most cases).
   What do they do ? How often do you see them ?

3. Tell me a bit about the place where you live ?

4. What do you like playing with ? Now and in the past ? Why ?
   Is there anything else you like playing with that is different to the things you've just told me about ?

5. Have you ever made anything ? When ? Did you enjoy this ?
   What did you use ? Did anyone help you ? How ?
   Have you ever built anything ? (Same questions as above).

5. Describe a typical day in your life. Remember to tell me everything about it - all the things you do are important.

6. Do you know what a motor car is ? Do you know how it works ? - why it goes ? How did you find a out?

APPENDIX 2: EXAMPLES OF TRANSCRIPTS OF INTERVIEWS IN THE SECOND PART OF THE RESEARCH,

1) Extracts from interview with subject 6, sample C:

TEMBA s 6 Tebogo (N Sotho)

I: Do you live in Temba?
S: Yes, in that house over there. The one with the door open.
I: Have you always lived here?
S: I dont know.
I: When I was little I moved from another place to where I lived, but I did not remember it. Did this not happen to you?
S; No, I think I have always been here.
I: Who do you stay with?
S: My mother, my father - and my brothers and sisters. I have 4.
I: Is it a small house you live in?
S: Yes, very small - my father wants a big house but he cant buy one. What is this (pointing to interviewer's badge)?
I: Its something we can play with just now if you want. But first tell me - what does your father do? And your mother?
S; My father works there (pointing to Babalegi), by a factory. My mother - she works at the hospital.
I: Where?
S: In this direction (points to Hammanskraal).
I: Is it the Jubilee Hospital?
S: Yes.

↓

I: What do you like playing with?
S: Dolls - I made myself two dolls. One is of my mother.
I: Thats nice. Id like to see that one sometime. Is there any thing else you like to play with?
S: Yes - with the boys. To play soccer. And I also like netball...
I: And...
S: I make houses for my dolls.
I: With what?
S: Things I find. I used a box one time.

↓

I: You said you made dolls. Is there anything else you make?
S: NO, not other things - but I made a place to hide with my brother.
I: What do you mean?
S: It was a hole in the ground. The other children could find us there.

↓

I: Do you know what a car is?
S: Yes. You come in it (sic). It is standing at the back of the school.
I: Yes, thats right. You must think I forgot. But what I really want to ask you is - do you know how it works?
S: Yes, that other man drives it. The white one.
I: But why does any car go?
S: I dont know - is it because it has got a machine?
I: I dont know. What do you mean?
S: There is a machine in it which pushes it.
I: Oh, thats right. How do you know?
S: I have seen it at the place where they fix cars.

2. Extracts from interview with subject 1, sample D:

ST JOHNS S 1 Michael

I: OK Now thats the hard part done. What I want to do now is ask you some things about yourself. Where do you live ?
S: In Mooi River - on a farm there. Its a stud farm for horses.
I: So are you a boarder here?
S: Yes. I go home in holidays.

I: What kinds of things do you like playing with?
S: Just about anything - Ive got all different kinds of toys. I suppose I like playing with building toys, like Lego you know...
I: What else?
S: I play a lot of sport - especially soccer and tennis. Oh, and I like riding my bicycle. But I still like things like Lego a lot.
I: So presumably you make things with Lego - like what?
S: I made houses, and also a whole Star Wars kind of place - with space ships and radar and things. You can make just about anything with Lego.
I: And what about other things you make?
S: You mean with Lego?
I: No - lets leave the Lego for a bit - what about other things?
S: Well, I had another building set - Ive forgotten what it was called now - and I made things with that.

I: Do you know how a moter-car works?
S: Yes, its got an in ternal combustion engine.
I: What is that - sorry, I dont really know.
S: C'mon.
I: No, seriously...
S: Well, its got pistons which drive it. My father drew apicture for me of the way it works. Here, Ill show you... (draws apicture). Ive looked at my fathers car, and it looks just like this....