PIAGETIAN OPERATIONS
IN RELATION TO MORAL DEVELOPMENT

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PIAGETIAN OPERATIONS IN RELATION TO MORAL DEVELOPMENT

ABSTRACT

The investigation attempted to determine what empirical links might be present among cognitive and moral factors in the adolescent's development. It was an attempt to elucidate and establish whether a relationship exists between operativity, as conceived by Piaget and moral development as postulated by Kohlberg.

The sample consisted of 231 subjects; the variables controlled were: (i) CA, 14 to 15+ years (ii) subjects were selected from urban areas, and (iii) sex. Piagetian stage groups of subjects (contrasted according to levels of logical reasoning) were selected and matched on finer discriminations with respect to age, social class and measured intelligence.


Three statistical techniques were employed: (a) Student's t test, (b) Correlation Coefficients and (c) Stepwise Multiple Regression Analysis.

The results indicated that:

1. A relationship exists between Piagetian operativity and moral development.

2. Logical reasoning is a relatively more effective indicator of moral maturity than a traditional intelligence measure.
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CHAPTER ONE

STATEMENT OF THE PROBLEM

The main concern in the problem to be expounded, is a cognitive hypothesis that intellectual capacity has a characteristic form at a given stage of development and that this form is parallel or isomorphic to the form of moral judgement at a corresponding stage.

Initially, the problem appears to relate to issues which were of concern to the Ancient Greeks and which are evident in a number of related philosophical doctrines; first, about the significance of knowledge for the mind and secondly, about the relationship between knowledge and reality. Hirst (1972) elaborates that in the first category there was the doctrine that it is the distinctive activity of the mind, because of its very nature, to pursue knowledge. The achievement of knowledge satisfies and fulfils the mind which thereby attains its own appropriate end. The pursuit of knowledge is thus the pursuit of the good of the mind and, therefore, an essential element in the good life. Further, that the achievement of knowledge is not only the attainment of the good of the mind itself, but also the chief means whereby the good life as a whole is to be found. Man is more than pure mind, yet mind is his essential distinguishing characteristic, and it is in terms of knowledge that his whole life is rightly directed. That knowledge is equal to its task was guaranteed by the second group of doctrines which asserted that the mind, in the right use of reason, comes to know the essential nature of things and can apprehend what is ultimately real and immutable. All his experiences, life and thought can be given shape and perspective by what is finally true, by knowledge that corresponds to what is ultimately real. Further, the particular way in which reason is here represented as attaining knowledge, results in a view of the whole of man's understanding as hierarchically structured in various levels. From the knowledge of mere particulars to that of pure being, all knowledge has its place in a comprehensive and harmonious scheme, the pattern of which is formed as knowledge is developed in apprehending reality in its many different manifestations. The Greek rationale, was therefore the freeing of the mind to function according
to its true nature, freeing reason from error and illusion and freeing
man's conduct from wrong. Such lines of inquiry have been the concern
of philosophers throughout time.

The boundary between psychology and philosophy has received
attention in various writings, for example Peters (1973) and Mischel
(1971). Piaget (1973) comments, that it has taken a long time to
determine the specific research aims of the science of psychology.
He attributes this to the early association and "subordination" to
philosophy, which resulted in the slow realization of the limits of
the introspection method and of the need to assign a place to
"consciusness" in the general scheme of behaviour. Further, once
approaches ceased to centre exclusively on introspection, the science
of psychology first found in man only a mixture of biological and
social elements. Piaget focuses on the "attitude of reserve" which
exists between Philosophy and Psychology, despite the existence of
persons thinking that psychological sciences alone cannot attain a
knowledge of man and needs the support of "philosophical psychology."

Piaget elaborates: "For many writers, particularly those with
positivist leanings, the difference between psychological science and
philosophical psychology (and then they generally dispute the latter
has any meaning) lies in the nature of the problems they are concerned
with, for psychological science, like any other science, is supposed
to be concerned only with 'observables' whereas philosophy supposedly
seeks to arrive at the nature of things and 'essence'." Piaget
emphasizes however, that the very history of psychology shows at once
the boundary between what are regarded as philosophical problems and
scientific problems, has constantly shifted in unforeseen directions.
He cites as an example, that towards the end of the 19th century,
psychologists were little concerned with the working of judgement
in connection with the intelligence, or dismissed it as relating to
the association of ideas, leaving it for logicians to enlarge on the
subject. Today, on the other hand, there are numerous theories of
the intelligence, and no one contemplates excluding judgement from
the purview of psychology. It can therefore be considered extremely
hazardous at the present time to divide up psychological problems
into scientific and philosophical ones, and the most common tendency is to regard science as infinitely open and deciding at every moment with which problems it is concerned.

Piaget (1957) referring to the classical logic of pre-nineteenth century, intent to discover the structure of thought processes and the normative laws of the mind and classical philosophical psychology, considering the laws of logic and the laws of ethics to be implicit in the mental functioning of each individual, further emphasises his regret with respect to the lack of collaboration between logicians and psychologists. With the development of experimental psychology, logical theory has been excluded and concomitantly an increase in the deductive rigour and formal character of logical systems has eliminated any appeal to psychological factors. Piaget (1973) acknowledges that superficially there does not appear to be any relationship between logic, which is a formal, deductive and normative science and psychology, which is concrete, experimental and in no way normative. However, two kinds of considerations make it necessary to establish some relationship between them: "recent trends oblige us to examine these considerations attentively." Although symbolic logic has been called "logic without a subject" there cannot be any subjects without logic. This "natural" logic poses a problem for psychologists who are then obliged to compare it to the formal logic of logicians. The other considerations which necessitate a comparison, derive not from the techniques of logic but from its epistemology. When epistemological logicians claim that logic is only a language (syntax and stripped down and generalized semantics) they are drawing nearer to psychology. Even when they are Platonists, as Bertrand Russell was at the beginning of his career, they are still bordering on psychology, for it remains to be discovered how men, in his mortal life can comprehend eternal Ideas: and for this purpose Russell invented a special mental function called 'conception', which applied to Ideas as perception does to objects. The epistemology of logic therefore implies a comparison with psychology."

Piaget has invoked the term genetic epistemology to describe his theory of intellectual development in the individual. A term, although criticised, (Hamlyn 1971), incorporating developmental psychology
and philosophical implications, without appearing to draw a hard
and fast line between psychology and philosophy. Hamlyn (1971, 1973)
defined Piaget's position as a kind of Kantian reconciliation of the
two opposing theories of empiricism and rationalism (Hamlyn, 1973,
defines empiricism as that approach which views the mind as passively
receiving reflections from without, while rationalism sees the mind
as more active in its own operations); though a reconciliation that
can be achieved only by the recognition of new elements, in particular,
the recognition of the importance of the active role played by the
individual. Piaget's reconciliation comes through the idea that
experience develops according to structures, which are, likewise, a
function of the human mind in its relationship to the world.

Elkind (1967) describes Genetic Epistemology as essentially
an experimental philosophy which seeks to answer epistemological
questions through the developmental study of the child. Like any
new discipline, genetic epistemology presupposes its own unique
problems, method and theory. The problems are to discover the
psychological structures that underlie the formation of concepts
fundamental to science. Piaget's method is the semi-clinical interview,
a form of non-directive inquiry, centred about a verbal or practical
issue. Finally, Piaget's theory in the most general sense, is that
of "subject-object equilibrium, the view that mental growth is
governed by a continual activity aimed at balancing the intrusions of
the social and physical environment with the organism's need to conserve
its structural systems." Piaget's theory has also been associated with
cognitive-developmental or interactional theory, first clearly
formulated by John Dewey (1903) and Baldwin (1906-15). Kant outlined
the structure of concepts and categories by means of which order is
imposed on the flux of experience and Piaget has been concerned in
mapping the stages at which the categorical apparatus of the Kantian
mind develops and for example the approximate ages at which for instance,
reversibility and seriation are possible mental operations for the
child. He demonstrates when children emulate Aristotle in classifying
and ordering the objects of the natural world and how they later
proceed to the hypothetico-deductive form of thinking, characteristic
of Galileo. Piaget further demonstrates the procedure of learning from
the simple to the complex and that concrete operations with objects precede abstract thought about them. The moral development of the child is also sketched in Kantian terms, the child passing from the stage of heteronomy to a stage of autonomy. Piaget claims that symbolic logic parallels the expediency of statistics as an instrument for psychologists and in his Traité de Logique (1949) he systematically outlined the logical principles which can be applied to the intellectual activities of the child. Piaget (1957) claims to have applied logical techniques to the psychological facts and has employed a psycho-logic to explain the psychological findings. Piaget (Inhelder and Piaget, 1958) further claims to have located a period of structuring leading to a level of equilibrium at 14 - 15 years, involving a set of operational structures based on propositional logic and a 'formal' mode of thought.

Research by Kohlberg and his associates has elaborated a cognitive approach to moral development (Blatt and Kohlberg, 1969; Kohlberg, 1963, 1964, 1969; Kohlberg and Kramer, 1969; Kohlberg and Turiel, 1971; Turiel, 1966). Inspired by psychological and philosophical traditions represented by Kent's ethical analysis, John Dewey's genetic, experiential and purposive reasoning (1910, 1916, 1930) and Piaget's structural approach to cognitive thought and moral development, its major emphasis is that the development of moral thought follows a universal sequence of distinct stages. Each stage represents a qualitatively different organisation of thought, not a set of specific beliefs. The individual does not model himself on his environment, he interacts with it. Kohlberg's assertion that universal justice is the highest form of moral development even in an imperfect society is rooted in the assumption that the individual has the innate capacity to recognise justice and to seek it (reminiscent of Plato). Kohlberg is also concerned with the relation between philosophy and psychology: Kohlberg (1971) deliberates that "the epistemological blinders psychologists have worn, have hidden from them the fact that the concept of morality is itself a philosophical (ethical) rather than a behavioural concept." He believes that it was because of his awareness of the necessity for orienting to philosophic concepts of morality when he started his research on the psychology of moral development (Kohlberg, 1958), that he has uncovered some quite important facts not previously noted.
Mischel (1971) draws attention to Piaget's "Les Relations entre l'Affectivité et l'Intelligence dans le Développement mental de l'Enfant", which defends the general thesis that affect and intelligence are complementary facets of mental development, distinguishable but inseparable "aspects" of all conduct (Piaget 1954a). References are made to this in many other works. Piaget uses "affect" in a very broad sense to cover feelings, emotions, desires, needs, interests and values and will, just as he uses "intelligence" broadly to cover all sorts of cognitive structures. Piaget's thesis states that (a) "there are no purely affective states without cognitive elements" to provide "structure" and (b) "there are no cognitive mechanisms without affective elements" to provide "energy". Piaget tries to show that "in the normal development of the individual, we observe, at each level, a sort of parallelism or strict correspondence between the transformation of affectivity and the transformations of cognitive functions." Moral feelings like truthfulness, justice, treating similar cases in similar ways, become the "invariants" of affective life, and the child develops a stable system of values which is, says Piaget "the logic of values or of action among individuals, just as logic is a kind of moral for thought." (Piaget, 1957). Similar contentions as those above are expressed in Piaget, 1932, in which the notion of equilibrium of thought operations, justice represents an ideal equilibrium of logical and moral stages are interactional, with reciprocity or reversibility being core conditions for both logical and moral equilibrium. While the sense of justice would not develop without the experience of social interaction, it is not simply an inward mirror of sociologically prescribed forms of these relations, any more than logic is an internalization of the linguistic forms of the culture. In Piaget's theory, the notion that logical and moral stages are interactional is united to the notion that they are forms of equilibrium, forms of integrating discrepancies or conflicts between the child's schema of action and the actions of others. The development of formal ("hypothetico-deductive") thought, with its shift of emphasis from the real to the possible, again transforms effective life in adolescence, since it is "the source of the living responses, always so full of emotion, which the adolescent uses to build his ideals in adapting to society," (Inhelder and Piaget, 1958). Formal thinking makes possible the adolescent's new interest
in abstract, collective ideals like social justice, political reform, etc., ideals which presuppose an understanding of possibilities rather than actualities. "We must recognise", states Piaget, that: "there is, in truth, as much construction in the effective as in the cognitive domain." Michael (op.cit.) comments that philosophers also have come to see that emotions, desires, and even feelings have a previously unsuspected conceptual complexity; these concepts were found to be such, that their application normally presupposes temporally extended and complex patterns of intelligent social life. (Hirst and Peters, 1970 and Peters, 1972, write in this vein).

It is of interest that Durkheim (1925) stresses that the teaching of physical and natural sciences plays an enormous role in determining the way we see things. A child is assisted in understanding how laws are evolved, through experimenting, failing, hypothesising, in realising that knowledge is provisional and needs to be modified and that truth cannot be discovered "at a single stroke." Societies are part of nature and natural sciences can help individuals "to better understand the human realm and equip us with precise ideas, good intellectual habits which can help us in directing our behaviour."

Kohlberg (Kohlberg and Gilligan, 1971) identifies himself with Piaget's formulations: "In Piaget's and our view, both types of thought and types of valuing (or of feeling) are schemata which develop a set of general structural characteristics representing successive forms of psychological equilibrium. "The equilibrium of effective and interpersonal schemata, justice or fairness, involves many of the same basic structural features as the equilibrium of cognitive schemata logicality." Kohlberg elaborates that what is being asserted, is not that moral judgement stages are cognitive - they are not the mere application of logic to moral problems - but that the existence of moral stages implies that normal development has a basic cognitive - structural component. By the insistence on the cognitive core of moral development is meant rather that the distinctive characteristics of the moral is that it involves active judgement. This therefore suggests that cognitive maturity is a necessary but not a sufficient condition for moral judgement maturity. Kohlberg
elaborates that though formal operations may be necessary for principled morality, one may be a theoretical physicist and yet not make moral judgements at the principled level. Kohlberg (1972) speculates that moral development may be partly interpreted as "décalage" but not "mere décalage" of cognitive development. Kohlberg (1971) further deduces that logical stages must be prior to moral stages because they are more general. This receives further support from Harrison (1971) in considering whether moral judgements can be regarded as "a priori" and analytic; of the same type as that two and one is three, or that if two things are each equal to a third being, they are equal to one another. He concludes that logical reasoning alone will enable us to keep our beliefs consistent with one another and yet be false. Hence logical reasoning alone, in morals will not tell us what to believe; it will merely tell us which combinations of beliefs are impossible, without enabling us to choose among the many logically possible combinations.

Various replications of the Piagetian approach to moral development (e.g., Whitman and Kosier, 1964) report IQ to be associated significantly with level of moral judgement. Using Kohlberg's measuring approaches, Simon and Ward (1973) and Graham (Unpub.) report significant relationships. Kohlberg (1964) reports moderate correlation with IQ (r = .31), but that moral judgement is highly related to age with intelligence controlled (r = .59). Kohlberg (1971) states that while IQ tests correlated with moral maturity, they do not correlate as well as Piaget tests (Kohlberg and DeVries, 1969). Lea (1971) among others discusses the superiority of Piaget tests as measures of cognitive capacity.

Arbuthnot (1973, cited in 1974) demonstrated a relationship between level of moral judgement maturity and the specific cognitive style field dependence - independence of Witkin et al. (1962). Schleifer and Douglas (1973) in a pre-school sample found children highest on moral maturity were least impulsive in cognitive style and more field independent. Brooke-Walsh and Sullivan (1973) from an investigation among twenty-eight boys from 8 years to 11 years, using a Piagetian moral judgement situation, together with a general reasoning task and Piagetian causal judgement, after finding no relation between moral judgement with causal reasoning and general reasoning, concluded that there is consistency in level of response to various tasks if the
general level of reasoning is high. No support is available when low general reasoning scores are used as predictors of level of response for the other tasks. Hardeman (1972) among 142, 1st Grade children using moral reasoning stories from Piaget and conservation and class inclusion tasks, found no direct relation between conservation and moral reasoning and class inclusion and moral reasoning, but identified great variation in moral reasoning scores for children who succeeded in all conservation tasks, then for those who succeeded in none; suggesting that the ability to give structure of an operational kind to inanimate, visible objects may be a prerequisite to the ability to give a corresponding structure to moral situations. Leo (1971) using adaptations of Piagetian and Kohlberg's approaches to moral development and six Piagetian cognitive tasks, among 195 boys of 5 - 17 years, supported Piaget's contentions that cognitive development and moral judgement "co-vary according to the different modes of conceptualization within the two dimensions of thought." Stephens et. al. (1969, 1972) in a longitudinal study of the development of reasoning, moral judgement and moral conduct in retarded and normals, reports significant but moderate relationships between measures of reasoning, moral judgement and moral conduct. Kimbell (1974) has focused on the dependence of cognitive development upon effective development and reports a high correlation between measures of Piagetian thinking and feeling. He concludes that if the effective atmosphere can be conducive to inquiry through resolution of tension at the feeling level, cognitive growth can be enhanced.

Rubin and Schneider (1973) claim to have provided clear support for the hypothesis, that among 7 year olds there is a positive relationship between decentration skill, as indicated by scores on communicative egocentrism and moral judgement and the incidence of altruism. Brown's et.al. (1973) investigation suggested that accurate appraisal of the interpersonal elements of a social situation is related to accurate perceptual activities in the impersonal world as well. Selman (1971) supported the hypothesis that in middle childhood (8 - 10 years) the greater ability to take another's perspective is related to higher levels of moral judgement (i.e. Kohlberg's pre-conventional and conventional levels). Further, that although reciprocal role-taking is a necessary condition for the
development of conventional moral thought, it is empirically possible to obtain the level of role-taking reciprocity and still remain at a preconventional moral level. For empirical validation for the isomorphism or "one-to-one parallelism" of cognitive and moral stages, Kohlberg cites De Vries (1969), Selman (op.cit.) and Kuhn, Langer and Kohlberg, (1971):

(a) Almost (93%) of children aged 5 - 7 who passed a moral reasoning task at Stage 2 passed a corresponding task of logical reciprocity or reversibility. However, many (52%) children who passed a logical task did not pass the moral task. (Kohlberg and De Vries op.cit.)

(b) Few, 16% children aged 9 - 11 at the conventional stages (Stages 3 and 4) of morality, failed a corresponding task involving the inversion of reciprocity in a cognitive role-taking task. Some (25%) children who passed the role-taking task, did not achieve conventional moral judgement. (Selmen, op.cit.)

(c) All adolescents and adults using Stages 5 or 6 reasoning arc capable of formal reasoning on the Inholder and Piaget pendulum and correlation problems. Many adolescents capable of the latter showed no Stage 5 or 6 moral reasoning (Kuhn, Langer and Kohlberg, 1971). (From the findings of Kuhn, Langer and Kohlberg, Rest (1973) concludes that Stage 4 requires low-level operational reasoning).

Additional to Kuhn, Langer and Kohlberg (op.cit.) the only other known study exploring the relationship between the period of formal operations and moral reasoning is Keesey and Keesey (1974). Employing six Kohlberg dilemmas and three formal operational tasks among 30, 6th Grade girls and 24 "Co-Eds", Keesey and Keesey conclude that their study supports a hypothesized "centrality" of cognitive development. With age held constant, the level of moral reasoning varied as a function of cognitive development. Further, logical operations were generally confirmed as a pre-requisite to principled moral reasoning. Finally, there was a "docelage" between functioning in the cognitive realm and that in the moral realm.
That there is parallelism or isomorphism between the development of the forms of logical and ethical judgement has been stated emphatically by both Piaget and Kohlberg. However, the empirical validation appears insubstantial and further evidence is required. The provision of such evidence is the primary objective of the present investigation, but it is hoped that it will also help to resolve a number of theoretical uncertainties in the area. For example:

1. The formal stage of cognitive development is a period in Piaget's theory that has received relatively little empirical attention. When put to experimental test, a number of serious questions have emerged concerning the empirical status of formal operations. Piaget, (Inhelder and Piaget, 1958) stated that formal thinking develops between the ages of 11 and 15. An equilibrium point, should be reached at age 15 years. A number of studies have reported low percentages of adolescents exhibiting formal thinking at age 15 years or at other ages during adolescence or adulthood. (Jackson, 1968; Tisher, 1971, Lunzer and Pumfrey, 1966; Lovell, 1961; Tomlinson-Kessay, 1972; Ross, 1973; Dulit, 1972).

2. Piaget has recently (Piaget, 1972) acknowledged research indicating differing results from the norms indicated from his Genoan subjects (which he here states to be from the "better" schools and which was "perhaps, based on a somewhat privileged population"). Discussing the effects of varying environmental stimulation and the point that the formal stage, being the final stage, would show a greater retardation Piaget concludes with the hypothesis that "if the formal structures do not appear in all children of 14 - 15 years and demonstrate a less general distribution than the concrete structures of children 7 - 10 years old, this could be due to the diversification of aptitudes with age ............ The span of aptitudes being greater at the level of 12 - 15 years and above all between 15 - 20 years, then at 7 - 10 years. In other words, our fourth period can no longer be characterised as a proper stage, but would already seem to be a structural advancement in the direction of specialisation." However,
a reconciliation of the concept of stages with the idea of progressively differentiating aptitudes would state "that all normal subjects attain the stage of formal operations or structuring if not between 11 - 12 to 14 - 15 years, in any case 15 and 20 years. However, they reach this stage in different areas according to their aptitudes and their professional specialisations (advanced studies or different types of apprenticeship for the various trades); the way in which these formal structures are used, however, is not necessarily the same in all cases." Piaget concludes "If we wish to draw a general conclusion from these reflections we must first say that, from a cognitive point of view, the passage from adolescence to adulthood raises a number of unresolved questions that need to be studied in greater detail."

3. Kohlberg (1963) and Kohlberg and Kramer (1969) with respect to the development of moral judgement report at age 10 years, Stage 1 responses are most frequent, followed by Stage 2, etc. Stages 5 and 6 responses are equally infrequent. By the age of 13 years, the sequence patterns: 4-3, 5, 2, 1, 6, with Stage 4 responses most frequent and Stage 3 not very far behind. Appreciably less frequently used are Stages 5, 2 and 1, all about the same, with Stage 6 least used. By the age of 16, Stage 4 and Stage 5 responses have increased further while Stage 6 responses remain at a low level of frequency. It seems very likely that with increasing age beyond 16, there will be some tendency for a relative increase in the frequency of Stage 5 and 6 responses. Kohlberg and Kramer, in fact, report a (barely significant) increase in Stage 6 thinking between 16 and 25, Stage 6 responses remaining rare. Kuhn, Langer and Kohlberg (op.cit.) report that only 10% of subjects over 16 years, showed clear principled (Stages 5 and 6) thinking.

4. Kohlberg additionally reports (Kohlberg and Mayer, 1970) that moral maturity at certain ages predicts adult terminal level. Children who do not utilize conventional moral reasoning by
13 years are unlikely to attain principled reasoning or behaviour in adulthood. The second transition appears to be in late adolescence, 15 - 19 years. Research suggest that subjects who do not use principled thinking at least 20% of the time by the end of "High School" are unlikely to develop principled thinking in adulthood. Kohlberg (1970) and Kramer (1966) elaborate that the correlation between moral maturity at age 15 and at age 25 years was .78. In a small sample (12) of subjects followed from 12 years onwards, the correlation between moral maturity at age 12 years and age 25 years was .92.

5. When studies attempting to relate cognitive development to functioning in other areas are examined, it is found that age rather than cognitive level has been relied upon as the independent variable. While there is little doubt that cognitive, social and effective progress are systematically related to age, it would appear that studies are needed which employ stage of cognitive development, rather than age, as the independent variable.

Post-conventional reasoning, the highest level of Kohlberg’s hierarchy, presupposes the capacity to form the formal operations of abstract thought. The development of formal operational thinking has been shown to be prone to great variability, although replications do not detract from the essential validity of Piaget’s formulations. It would appear that clear principled thinking displays a greater degree of rarity and reaches equilibrium at later ages than formal operations. However, the passage from concrete to formal operations and the transitions from the various levels of moral judgement are not all-or-none phenomena and it is apparent that a study of a transitional period, within a narrow age range, with level of cognitive development being the independent variable, allowing finer degrees of measurement rather than broad categorization, from a more extensive battery of formal operational tasks, would enable further illumination of the development within the logical thinking and moral areas. Further, additional data with respect to the development of formal operations among British adolescents will be obtained together with the collection of data emanating from the application of Kohlberg’s moral judgement interview to a British sample. (Graham (unpub.) and
Kotalewala (1971), Langford (1975, private comm.) are the only known British studies involving the use of Kohlberg's measures.

Therefore the problem under investigation focuses on the relations between developments in the two domains, logical and moral: to examine the actualized ontogenetic relation in middle adolescence between stages of logical reasoning and stages in a social domain, namely moral judgement. Evaluations will be made on the general theoretical question of the interrelations among stage developments as they occur in different conceptual domains, involving an attempt to logically or conceptually relate development stages in the logical and moral domains. Further light should be shed on the isomorphism of the two areas, together with further speculation with respect to the notions of the centrality of cognitive development and a décalage between the acquisition of logical operations and their application to other areas of development. The hypotheses to be tested may be stated formally as follows:

1. That a relationship exists between Piagetian operativity and moral judgement.

2. That measures of logical reasoning are relatively more effective indicators of moral maturity than traditional measures of intelligence.
CHAPTER TWO

THE GROWTH OF LOGICAL THINKING --

CONCRETE AND FORMAL OPERATIONS

A. INTRODUCTION

B. PIAGET AND LOGIC

C. PIAGET'S LOGICAL MODEL

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   The Sixteen Binary Operations and the
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D. CRITIQUE OF PIAGET'S LOGICAL MODEL

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G. OTHER APPROACHES TO THE STUDY OF FORMAL OPERATIONS
A. INTRODUCTION

Piaget's creation of a new discipline of genetic epistemology is essentially an experimental philosophy which seeks to answer epistemological questions through the developmental study of the child. Elkind (1967) defines Piaget's theory in the most general sense, as "subject-object equilibration, the view that mental growth is governed by a continual activity aimed at balancing the intrusions of the social and physical environment with the organism's need to conserve its structural systems". Piaget's genetic epistemology can be seen to have evolved through three more or less distinct phases: initial focus on the parallels between the notions constructed by children and those maintained by the philosophers of antiquity, suggesting constancy of modes of conceptualization relatively independent of historic-cultural conditions, together with demonstration that the child spontaneously constructs ideas about the world which are erroneous from the adult view, provided a challenge to the "all-nurture" and extreme environmentalist views prevalent at the beginning of the century. The second phase involving a detailed study of the sensorimotor coordinations of infants, demonstrated the infantile forerunners of cognitive structures. The current phase, commencing about 1940, has been concerned with delineating the development of logic — mathematical thought from infancy through adolescence, with a recent extension to adulthood (Piaget, 1972).

Three themes have persisted throughout Piaget's research: logic, relativity and dialectics. Logic is inherent in the mind, in biological processes and in the laws that govern the physical world and is therefore the genotypic link between the phenotypic diversity of the sciences. The inherence of logic in the primitive, psychic activity of the infant, to the formal and systematic logical system of the adolescent, is the basis of epistemology. Epistemological relativism permeates Piaget's
thinking about the construction of reality: if as Einstein had shown, conceptual judgements were always relative to the position of the observer making those judgements, then the observer could never be left out in the construction of concepts. Therefore, reality can be seen as always involving a subjective element, in the sense that it is in part, a projection or externalization of thought or action. Dialectics is synonymous with the dynamics of the acquisition of knowledge and Piaget introduced the notion of equilibration as being the overriding factor that determines the mode of interaction of maturation, physical experience and social experience. Elkind (op. cit) paraphrases that "at each level of development there are two poles of activity: changes in the structure of the organism in response to environmental intrusion (accommodation) and changes in the intruding stimuli due to the existing structure (assimilation). These two poles of activity constitute a sort of thesis and antithesis whose eventual synthesis is affected by a process of equilibration". Piaget (1967) elaborates that in the case of the lower, unstable (sensorimotor and perceptual) forms of equilibrium, the intrusion consists of real and actual modifications of the environment, to which the compensatory activities of the subject respond as best they can without a permanent operational system. In the case of the higher or operational structures, the intrusion to which the subject responds may consist of virtual modifications; that is, in optimum cases they can be imagined and anticipated by the subject in the form of the direct operations of a system (operations expressing transformations). In this case, the compensatory activities will consist of imagining and anticipating the transformations but in an inverse sense (reciprocal or inverse operations of a system of reversible operations).

II. PIAGET AND LOGIC

In alignment with his emphasis on logic, Piaget claims that symbolic logic parallels the expediency of statistics as an instrument for psychologists and in his Traité de Logique (1949) he systematically outlined the logical principles which can be applied to the intellectual activities of the child. Piaget (1957) emphasized that his aim is not to formalize psychological theories by means of logic but to apply
logical techniques to the psychological facts. The qualitative character of logic facilitates the analysis, specification and expression of the actual structures underlying intellectual operations as opposed to the quantitative treatment of the behavioural outcome, the concern of most conventional tests of intelligence. Referring to the classical logic of the pre-nineteenth century intent to discover the structure of thought processes and the normative laws of the mind and classical, philosophical psychology considering the laws of logic together with the laws of ethics to be implicit in the mental functioning of each individual, Piaget regrets the lack of collaboration between logicians and psychologists. With the development of experimental psychology, logical theory has been excluded and concomitantly, an increase in the deductive rigour and formal character of logical systems has eliminated any appeal to psychological factors. Piaget grants that from the standpoint of perfectly formalised axiomatic logic, logical relations are strictly applicable only to mathematical deduction, since every other form of thought merely has an approximate character.

Piaget in attempting to discover the entities to which the logical structures correspond, dismisses three of the possible explanations provided by the progressive formalization of logic. "Platonism" considering that logic corresponds to a system of universals existing independently of experience does not provide explanation with respect to the discovery of the universals; "Conventionalism", holding that logical entities owe their existence and laws to a system of conventions or accepted rules does not indicate reasons for the effectiveness of application of those conventions; and "well-formed language", representing that logic is merely a language, cannot be accepted on the grounds that experience cannot be interpreted in abstraction from the conceptual and logical apparatus which makes such an interpretation possible and further, that logical relationships never appear as a simple system of linguistic or symbolic expressions. However, "Operationalism" provides real ground on which logic and psychology can meet: since logic is based on abstract algebra and made up of symbolic manipulations, operations play an indispensable role and as operations are actual psychological activities, all effective knowledge is based on such a system of operations.
Piaget (1957) therefore concludes, that in order to determine the relations between logic and psychology, it is necessary to construct a psychological theory of operations in terms of their genesis and structure; to examine logical operations, treating them as algebraic calculi and as "structured wholes" and to compare the results of these two kinds of enquiries. However, axiomatic logic is unsuitable due to its highly formalized mathematical character and linear order and as psychological mechanisms contain elements connected in the form of a cyclical system, Piaget considers it is necessary to interpolate between psychology and axiomatic logic, a 'psycho-logic' or 'Logico-psychology', constructing by means of the algebra of logic, a deductive theory to explain some of the findings of psychology.

C. PIAGET'S LOGICAL MODEL

With the publication of "The Growth of Logical Thinking: from Childhood to Adolescence" (Inhelder and Piaget, 1956), Piaget, together with Inhelder was able to present the most complete account of his stages in the development of logical thinking. From further developments to the symbolic model by Piaget and a systematic, empirical study of the induction of physical laws in children and adolescents by Inhelder, a 'striking convergence' was found between the empirical and analytic results. Although Piaget had previously stressed a stage of development beginning at 11 - 12 years, Inhelder's data indicated a period of new structuring leading to another level of equilibrium at about 14 - 15 years. This set of operational structures were found to be based on propositional logic and a 'formal' mode of thought and further, the techniques of propositional

* "By a structured whole, 'structure d'ensemble', Piaget refers to a system of elements defined by a general set of laws, such as the laws which define a group or a lattice. For example, a logical groupement is defined by a set of five operations, and in this case forms a 'structure d'ensemble' (since the laws define the system as a whole) and is thus to be distinguished from the individual operations themselves" (Maye, 1957)
logic were inadequate to analyze the integrated structures of operations. In attempting to explain the additional presence of a series of operational schemata, namely combinatorial operations, propositions, double-systems of reference, a schema of mechanical equilibrium, multiplicative probabilities and correlations etc., together with propositional logic, Piaget found it necessary to refer to the 'integrated structures' on which they were based; that is, to the dual structure of the lattice and the group of four transformations. Further illumination was provided for the earlier set of concrete structures and Inhelder and Piaget were enabled to describe the changes in logical operations between childhood and adolescence, while analyzing and isolating the formal structures marking the completion of the operational development of intelligence.

The work records the results of fifteen separate experiments divided into those demonstrating the development of propositional logic and those concerned with the operational schemata of formal logic. Children aged from 5 - 16 years were presented with apparatus which would enable them to deduce some more or less general principle by appropriate experimentation. By means of the clinical approach the experimenter recording the behaviour of the child, questioning and prompting, the strengths and limitations of the strategies governing action were discovered. (Some of these experiments have been utilized in the present study and details are provided in Chapter Five and in the Appendices).

The subjects' responses allowed categorization into four main groups: children of five or six years, approached the problem subjectively due to their inability to dissociate their own action from their effects. From about seven years of age, subjects were more successful in initiating an event and judging the result, but were unsuccessful in eliminating all the remaining variables, using the method of "all other things equal". Even at eleven or
twelve years, unambiguous experiments were not spontaneously devised; although adolescents were able to realize the inadequacy, when questioned. Only at the age of thirteen or fourteen were adolescents able to spontaneously adopt the strategy of deliberately varying each of the factors in turn, holding all others constant. From the complete series of experiments, Piaget particularized the changes in logical operations between childhood and adolescence.

At the end of the sensorimotor period, during which intelligent behaviour is limited to coordinating actions, the appearance of symbolic processes enables the child to organize elementary representations and to develop a distinctive form of pre-operational thinking between the ages of two and seven to eight years. At this level the child is likely to explain static situations in terms of the characteristics of their configurations at a given moment; when transformations are considered, they are assimilated to personal actions rather than reversible operations. Although there are tendencies toward the organization of integrated systems, the organization is dependent upon perceptual or incomplete and approximate compensations, in contrast to actual operations which entail complete compensations.

Piaget (Inhelder and Piaget, 1952) continues: "with the appearance of concrete thought, the system of regulations, though maintained in an unstable state until this point, attains an elementary form of stable equilibrium. As it reaches the level of complete reversibility, the concrete operations issued from the earlier regulations are coordinated into definite structures (classifications, serial orders, correspondences etc.) which will be conserved for the remainder of the life span". The dichotomy between static situations and transformations no longer obtains as static situations are subordinated to transformations, in that every state is conceived of as the result of a transformation. Each position of a balance scale is seen as the result of previous additions and subtractions of weight or of equalities and inequalities.
introduced between the weights on the two arms of the apparatus and between the distances from the fulcrum. Further, these transformations have a reversible form and the potentiality for coordination according to fixed laws of composition, and are assimilated to operations resulting from the internalization of actions and preoperational regulations from the earlier stage.

In comparison to the previous stages, concrete operational thought is characterized by an extension of the actual in the direction of the potential. In classifying a set of objects, a set of class inclusions is constructed to allow new objects to be included in systematic relationship, new class inclusions being continually possible. However, the equilibrium field of concrete operations is limited both by the form of the operations involved and the actual content of the notions to which they are applied. Concrete operations consist of nothing more than a direct organization of immediately given data: the operations of classifying, serial ordering, equalization, correspondences etc. are means for inserting a set of class inclusions or relations into a particular content (e.g. lengths, weights, etc.), means which are limited to organizing this content in the same form in which it is presented. The role of possibility is reduced to a simple potential, prolongation of the actions or operations applied to the given content as, for example, "when, after having ordered several objects in a series, the subject knew that he could do the same with others, this by virtue of the same schema of expectation for serial ordering that enabled him to perform his actual serial ordering". From the standpoint of content, concrete thought has the limiting characteristic that it cannot be immediately generalized to all physical properties. It proceeds from one factor to another, sometimes with a lag of several years between the organization of one, for example lengths, and the next, for example, weights; due to the difficulty in ordering serially and equalizing objects whose properties are less easy to dissociate from personal action, such as weight, than to apply the same operations to properties which can be objectified more readily, such as length. Therefore, from the standpoint of content, "potential transformations
compatible with the system links" which determine the boundary line between real and possible operations, are still more limited than is implied by the form of the operations involved and again illustrate that the form of possibility characterizing concrete operations is merely a limited extension of empirical reality. Additionally, the concrete equilibrium, although stable at the interior of a given field, becomes unstable at its boundaries; instability occurs when fields have to be coordinated. There is no general concrete composition; concrete thought is unable to solve "all the problems raised by the interference of heterogeneous operations or by the intersection of different properties"; only a limited set of potential transformations can be employed. The elementary "groupings" which constitute the only integrated structures accessible at the concrete operational level are therefore systems of single or multiple class inclusion or linkage and do not include a combinatorial system linking the various elements n by n. The mechanism of reversibility consists either of inversion (for classes) or reciprocity (for relations) but the two are not integrated into a simple system. The most complex groupings in concrete thinking, multiplicative groupings involve the construction of four multiplicative classes AB, AB', A'B and A'B'. The concrete thinker is unable to enumerate the factors exhaustively, or to demonstrate conclusively, the effects of those factors which are discovered; there is a lack of systematic method and an inability to vary a single factor at one time, while holding the other constant. Piaget anticipates difficulty in the interpretation of his differentiation between the coordination of possibilities characteristic of the concrete operational child and the forming of hypotheses and emphasizes that at the concrete stage the child-structures only the reality on which he acts and is incapable of imagining what the real situation would be if various hypothetical conditions were fulfilled.

The final stage of formal thought emerges at eleven to twelve
years, culminates in late adolescence and extends to the mature thought processes of the adult. The significance which Piaget attaches to the change from concrete operations to formal operations is reflected in a change in the symbols of logic; from the use of 'A and C' to the logical symbols 'p, q' for the same formal operation. The most distinctive property of formal thought is the reversal of the direction of thinking between 'reality' and 'possibility' in the subject's method of approach. "Possibility" no longer appears merely as an extension of an empirical situation or of actions actually performed; it is "reality" that is now secondary to "possibility". Henceforth, they conceive of the given facts as that sector of a set of possible transformations that has actually come about; for they are neither explained nor even regarded as facts until the subject undertakes verifying procedures that pertain to the entire set of possible hypotheses compatible with a given situation. Formal thinking is essentially hypothetico-deductive; deduction is no longer in reference to perceived reality but to hypothetical statements, to propositions (formulations of hypotheses or postulations of facts or events independently of whether or not they actually occur). The deductive process consists of linking up the various assumptions, drawing out the necessary consequences, even when the validity is only provisional, and subjecting them to empirical verification. With the proviso that all verbal thought is not necessarily formal in character, Piaget considers that concern with verbal elements as opposed to objects is a prominent feature of formal thinking. Piaget is intent to stress however, that propositional logic, although presupposing an inner verbal thought, is not verbal logic, for it offers a much greater number of operational possibilities, disjunctions, implications, exclusions etc. It is a logic of all possible combinations and its real power lies not in verbal support but in the combinatorial power which makes it possible for reality to be fed into the set of possible hypotheses compatible with the data. Piaget comments that when it
was realized that a verbal criterion was inadequate to define formal thought, a definition in terms of a system of "second degree operations" was sought, the structuring of relations between relations. Formal thought constitutes a combinatorial system, multiplications of multiplications, furnishing the total number of possibilities.

In equilibrium, the succession of mental acts is affected not only by the operations actually performed, but also by the entire set of possible operations in so far as "they orient the subjects searching toward deductive closure". Piaget centres on the distinction between a momentary and partial disequilibrium relative to a single, new problem, the solution of which is not immediately visible and disequilibrium, where the necessary operations have not been acquired. Piaget (1967) in considering the "most equilibrated structures", reiterates the view that equilibrium involves the total set of possible operations constituting a system of potential transformations which compensate each other in so far as they conform to the laws of reversibility, and further, that the final psychological equilibrium of the cognitive structure is confounded with the reversibility of the operations, "since the inverse operations exactly compensate the direct transformations". He posits whether reversibility of the operations engender their equilibrium, or the progressive equilibration of the actions engender their terminal reversibility. However "genetic analysis" seems decisive that since the compensations which respond to the intrusion adjust themselves only progressively, the operational reversibility expressed by the complete compensations must be the result and not the cause of gradual equilibration.

1. Interpropositional Operations as Lattices -

The network of hypothetical possibilities which the adolescent's newly acquired combinatorial operations have generated, constitutes
a lattice and from this fact, derives Piaget's assertion that formal operations have lattice structure.

As indicated in the previous section, the concrete operational subject is able to observe and record a limited number of associations between occurrences and nonoccurrences of variables and an event. It might be established that all four of the following associations are found to occur at one time or another: \( A \times B \) (\( X \) occurs with \( B \) present), \( A \times B' \) (\( X \) also occurs with \( B \) absent), \( A' \times B \) (\( X \) sometimes fails to occur when \( B \) is present) and \( A' \times B' \) (\( X \) can also fail to occur when \( B \) is absent). These associations can be symbolized as a totality: \((A \times B) + (A \times B') + (A' \times B) + (A' \times B')\) and are a product of a one-one class multiplication. The concrete operational subject cannot however proceed much farther being preoccupied with the immediate reality before him and expecting the solution to emerge from this multiplicative activity.

These base class associations have for the adolescent however, a propositional rather than a concrete class-product significance. In accordance with the distinctions made in the previous section, the younger subjects discover the associations in application to the data, whereas the older subjects are able to conceive associations as propositions for empirical test, prior to experimentation. The isolation of variables necessarily leads the subject to combine the base associations among themselves "n by n" in which the multiplicative class system serves as a base, "by this means he applies the simplest of groupings (classification) to the most general (the table of logical multiplications) and ends up with a sort of second-degree grouping which coordinates all of the groupings in a higher order system, since he cannot integrate them directly". This second-degree grouping formulated by application of the generalized classification to multiplicative associations is none other than an "n by n" combinatorial system. A sixteen-element matrix formed by two propositions and their negatives is the prototype of the combinatorial system due to its position as the smallest matrix to be constructed, having only two variables (propositions), each variable having only two values (true or false). Because so much of formal-stage reasoning is concerned with trying to relate
just two variables, all other things being held constant, the 16-element matrix is the combinatorial system recurring most frequently in Piaget's logical analysis of the interview data.

In accordance with Piaget's symbolic progression at the formal stage, $A \times B \setminus A \setminus B \setminus A \setminus B$ can now be symbolized:

$p \cdot q$, $p \cdot \bar{q}$, $\bar{p} \cdot q$ and $\bar{p} \cdot \bar{q}$. From the four base associations derived from $p$ and $q$ by the numbers 1 to 4: 1 = $p \cdot q$; 2 = $p \cdot \bar{q}$; 3 = $\bar{p} \cdot q$ and 4 = $\bar{p} \cdot \bar{q}$, sixteen classes result from the various possible inclusions.

\[
\begin{align*}
(1) & \quad 0 & \quad \text{i.e., } (p \cdot q) \lor (p \cdot \bar{q}) \lor (\bar{p} \cdot q) \lor (\bar{p} \cdot \bar{q}) \\
(2) & \quad 1 & \quad \text{i.e., } p \cdot q \\
(3) & \quad 2 & \quad \text{i.e., } p \cdot \bar{q} \\
(4) & \quad 3 & \quad \text{i.e., } \bar{p} \cdot q \\
(5) & \quad 4 & \quad \text{i.e., } \bar{p} \cdot \bar{q} \\
(6) & \quad 1 \lor 2 & \quad \text{i.e., } (p \cdot q) \lor (p \cdot \bar{q}) \\
(7) & \quad 1 \lor 3 & \quad \text{i.e., } (p \cdot q) \lor (\bar{p} \cdot q) \\
(8) & \quad 1 \lor 4 & \quad \text{i.e., } (p \cdot q) \lor (\bar{p} \cdot \bar{q}) \\
(9) & \quad 2 \lor 3 & \quad \text{i.e., } (p \cdot \bar{q}) \lor (\bar{p} \cdot q) \\
(10) & \quad 2 \lor 4 & \quad \text{i.e., } (p \cdot \bar{q}) \lor (\bar{p} \cdot \bar{q}) \\
(11) & \quad 3 \lor 4 & \quad \text{i.e., } (\bar{p} \cdot q) \lor (\bar{p} \cdot \bar{q}) \\
(12) & \quad 1 \lor 2 \lor 3 & \quad \text{i.e., } (p \cdot q) \lor (p \cdot \bar{q}) \lor (\bar{p} \cdot q) \\
(13) & \quad 1 \lor 2 \lor 4 & \quad \text{i.e., } (p \cdot q) \lor (p \cdot \bar{q}) \lor (\bar{p} \cdot \bar{q}) \\
(14) & \quad 1 \lor 3 \lor 4 & \quad \text{i.e., } (p \cdot \bar{q}) \lor (\bar{p} \cdot q) \lor (\bar{p} \cdot \bar{q}) \\
(15) & \quad 2 \lor 3 \lor 4 & \quad \text{i.e., } (\bar{p} \cdot q) \lor (\bar{p} \cdot \bar{q}) \lor (\bar{p} \cdot \bar{q}) \\
(16) & \quad 1 \lor 2 \lor 3 \lor 4 & \quad \text{i.e., } (p \cdot q) \lor (p \cdot \bar{q}) \lor (\bar{p} \cdot q) \lor (\bar{p} \cdot \bar{q})
\end{align*}
\]

Figure 1.

\* = Conjunction (both p and q)
\* = Negation
\* = Disjunction (either p or q or both)
Boyle (1969) sets out the following tabulation modified from Baldwin (1967) as indication of the relations between the sixteen binary operations, which are illustrated by means of truth tables.

**Figure 2.**

**Key**

<table>
<thead>
<tr>
<th>p</th>
<th>p</th>
<th>q</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

representing $2 + 4$ which in turn represents $(p \cdot q) \lor (\overline{p} \cdot \overline{q})$

<table>
<thead>
<tr>
<th>p</th>
<th>p</th>
<th>q</th>
<th>q</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

representing $1 + 2 + 3 + 4$ which in turn represents $(p \cdot q) \lor (p \cdot \overline{q}) \lor (\overline{p} \cdot q) \lor (\overline{p} \cdot \overline{q})$
Interpretation can be clarified as follows:

Truth table 12 is made up of tables 6, 7 and 9.

Figure 1 indicated that:

operation 12 is compounded of operations 1, 2 and 3.

Figure 1 indicates that:

operation 6 is made up of operations 1 and 2
operation 7 is made up of operations 1 and 3 and
operation 9 is made up of operations 2 and 3.

In Figure 2, table 6 is composed of table 2 (representing operation 1)
and table 3 (representing operation 2).

Tables 6 and 7 are connected to table 2.

Truth table 2 shows that tables 6 and 7 have in common.

If reference is made to Figure 1, it is found

That operation 6 equals operations 1 and 2
whilst operation 7 equals operations 1 and 3.

Tables 6 and 7, therefore have operation 1 in common (i.e. p.q)

In simplification of the expressions of the binary operations:

Operation 12 = (p . q ) v (p . q ) • (p • q )

When p is true, q may be either true or false, but that when p is false then q is true; or alternatively 1-p 1-q .

The conditions with which 1-p 1-q is compatible or incompatible - 1-p 1-q = (p . q ) v (p . q ) v (p . q ) but 1-p 1-q 2

Truth table 12 shows that the cells corresponding to p.q, p.q and 1-p 1-q are occupied but that the cell corresponding to 1-p 1-q is empty.

Therefore for operation 12, 1-p 1-q can be written.

Similarly operation 13 is equivalent to 1-p 1-q
operation 14 is equivalent to 1-p 1-q
operation 15 is equivalent to p 1-q

1-p 1-q = implication (if - then 1-p 1-q = "if p then q")
1-p 1-q = incompatibility (p 1-q / p 1-q = the relationship "if p then q" is incompatible with the simultaneous truth of p and the falsity of q).
Operation 6 asserts \((p \cdot q) \lor (p \cdot \bar{q}) = \)
that \(p\) is true whether or not \(q\) is true; \(\therefore p\) is true.

Operation 7 asserts \((p \cdot q) \lor (\bar{p} \cdot q) = \)
that \(q\) is true whether or not \(p\) is true; \(\therefore q\) is true.

Operation 8 asserts \((p \cdot q) \lor (\bar{p} \cdot \bar{q}) = \)
when \(p\) is true, \(q\) is true, when \(p\) is false \(q\) is false; \(\therefore p = q\).

Operation 9 asserts \((p \cdot \bar{q}) \lor (\bar{p} \cdot q) = \)
when \(p\) is true \(q\) is false and when \(p\) is false \(q\) is true, or \(p / q\).

Operation 10 asserts \((p \cdot \bar{q}) \lor (\bar{p} \cdot \bar{q}) = \bar{q}\).

Operation 11 asserts \((\bar{p} \cdot q) \lor (p \cdot \bar{q}) = \bar{p}\).

It is already known that operations 2 - 5 are \(p \cdot q\), \(\bar{p} \cdot q\), \(p \cdot \bar{q}\) and \(\bar{p} \cdot \bar{q}\), respectively, so the table of relationships may be written as in Figure 3, where the 16 binary operations are expressed as propositional relationships.

<table>
<thead>
<tr>
<th>(p \lor q)</th>
<th>(p \lor \bar{q})</th>
<th>(p \lor q)</th>
<th>(p \lor \bar{q})</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>(\bar{p} \lor q)</td>
<td>(p \lor \bar{q})</td>
<td>(p \lor q)</td>
<td>(p \lor \bar{q})</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>(p)</td>
<td>(q)</td>
<td>(p \lor q)</td>
<td>(p / q)</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>(p \cdot q)</td>
<td>(p \cdot \bar{q})</td>
<td>(p \cdot \bar{q})</td>
<td>(\bar{p} \cdot \bar{q})</td>
</tr>
</tbody>
</table>

\(p\) and \(q\) are independent

1
null

Figure 3
It can be seen from Figure 3 how more complex relationships might be expressed: \( p \rightarrow q \) meaning \( p \) is false and the falsity of \( p \) implies the truth of \( q \).

By combining together the 16 binary operations, 256 'tertiary' operations would be obtained, (i.e. \( 16 \times 16 \)).

64, 256 'quaternary' operations would be obtained by combining 236 'tertiary' operations.

2. **Intepositional Operations as Group - The Ising group**

Synonymous with the lattice properties are the properties of the group. Piaget asserts that the formal operational subject in certain problem situations attests to a cognitive structure with the properties of a four-group, a mathematical group whose elements consist of four transformations: Identity (I), Negation (N), Reciprocal (R) and Correlative (C).

Firstly, the four-group directly concerns the propositional operations. Flavell (1963) gives the following illustration, based on Piaget's explanations, of the transformation of \( p \lor q \) into a different operation in a variety of ways.

(I) This null transformation changes nothing in the proposition on which it is performed. If the proposition is \( p \lor q \) then
\[ I(p \lor q) = p \lor q, \quad I(p \rightarrow q) = p \rightarrow q, \quad I(p \lor q) = p \lor q. \]

(R) This transformation changes everything in the proposition on which it bears. All assertions become negations and vice versa and all conjunctions (\( \land \)) become disjunctions (\( \lor \)) and vice versa.
\[ N(p \lor q) = \overline{p} \cdot \overline{q}, \quad N(p \cdot q) = \overline{p} \lor \overline{q}, \quad N(p \lor q) = p \cdot q. \]

(R) This transformation permutes assertions and negations but leaves conjunctions and disjunctions unchanged. For example
\[ R(p \lor q) = \overline{p} \lor \overline{q}, \quad R(p \cdot q) = \overline{p} \cdot \overline{q}, \quad R(p \lor q) = p \lor q. \]
(c) This transformation permutes conjunctions and disjunctions but leaves assertions and negations unchanged. \( R(p \lor q) = p \land \neg q, R(p \land q) = \neg p \lor \neg q \).

These four transformations \( I, N, R \) and \( C \) form the elements of a group under the operation of multiplication or combination. The multiplication of any 2 or more of these four transformations is equivalent to the solitary application of some one of them,

\[
NRC = I, NR = C, IM = N, NC = R, IRC = N, NRNC = N \text{ etc.}
\]

The second application of the four-group entails transformations within physical systems rather than transformations of propositions per se. The physical system whose transformations have the INRC group structure contain two distinct and different operations \( p \) and \( q \) which have exactly equivalent outcomes or effects, together with two other operations \( p^* \) and \( q^* \) which nullify \( p \) and \( p^* \). Flavell, illustrates thus:

(I) \( I(p) = p, I(q^*) = q^* \).

(II) \( I(p) = p^*, I(q) = q^*, R(p^*) = p, \text{ and } R(q^*) = q \).

(III) \( R(p) = q^*, R(q) = p^*, R(p^*) = q \text{ and } R(q^*) = p \).

(IV) \( C = NR, \therefore C(p) = \neg \neg \neg (p) = p, C(q) = p, C(q^*) = q^* \text{ and } C(p^*) = p^* \).

Flavell discusses the connection between the INRC transformations with respect to propositions (termed by Flavell as the logical INRC group) and INRC transformations in relation to physical systems (identified by Flavell as the physical INRC group). He refers to Parsons (1960) for support for the distinction between these two forms of the group. He identifies Piaget's apparent treatment as being essentially synonymous. However, Flavell's interpretation of Piaget's reasoning leads to the suggestion that the logical INRC group is a subsistence of propositional thinking and in manipulating and interrelating the sixteen binary propositions, the adolescent
realizes that one is the reciprocal or negation of another and INRC group properties are acquired. Thus Piaget appears to consider the "logical INRC group", the bridge between the development of propositional thinking and the "more specific acquisition of a negation-reciprocal strategy in problem-solving" which is in turn carried over to the solution of physical-systems problems, with its entailment of the successful coordination of reciprocal and negation operations. Flavell concludes that adolescent thought can be conceived "in terms of an integrated and unified group-lattice totality which forms the common genotype for a wide variety of different-looking phenotypes. In accord with Piaget's general equilibration model, formal-operational thought is a structure in equilibrium which integrates the structural elements of the preceding, developmental period"; implying the several concrete-operational groupings integrated into the lattice structure and the bringing into a single system through the INRC group, the negation and reciprocal operations previously isolated in separate groupings in the concrete stage. It is of importance to note that the combinatorial system and the INRC group are not expected to be manifest and explicit in the interview material. They are inferred from the subject's capacity to seek for and to operate with those combinations which are necessary and sufficient to enable him to test hypotheses and to solve problems at the formal level. Thus as Dulit (1972) summarizes "they are conceptualized as latent rather than manifest and implicit rather than explicit".

3. Formal Operational Schemas

Piaget, (Inhelder and Piaget, op. cit.) examines the operational schemata as opposed to the particular operations that constitute these schemata. Piaget defines operational schemata as "the concepts which the subject potentially can organize from the beginning of the formal level when faced with certain kinds of data; but which are not manifest outside these conditions". Flavell considers that the
adolescents cognitive achievements can be categorized on a
general-specific dimension. Most general is the "structure
d'ensemble," the integrated group-lattice total structure which
Piaget believes to be behind all adolescent thought. More
specific are particular and task-linked concepts which this
total structure permits the adolescent to work out in the course
of experiments with particular Piaget problems: e.g., the laws
governing balance and imbalance of weight-scale arms, in terms
of weight on the pan, distance from the fulcrum etc. The set
of conceptual instrumentalities which Piaget calls formal-
operational schemas is at an intermediate level of generality;
like the task-linked concepts, the schemas owe their existence
to the general lattice-group and are also used for the solution
of concrete problems, but are more general in that each
operational schema has application to a whole set of problems
rather than a single problem.

Piaget describes eight schemas indicating the group-lattice
connection and the concrete problems in which the schemas can
be adopted: namely combinatorial operations, proportions,
coordination of two systems of reference and the relativity of
motion or acceleration, the concept of mechanical equilibrium,
probability, correlation, multiplicative compensations and the
forms of conservation "which go beyond direct empirical
verification".

Piaget therefore concludes that the various operational
possibilities implied by the integrated structure, comprising
the lattice and the group found in formal thinking, give rise
to the organization of operational schemata. These schemata
often differ greatly from each other and are not linked together
by subject, but they appear in more or less integrated form
and even synchronously during the formal stage.

Piaget concludes that "the concept of equilibrium proves
indispensable to causal explanation. It makes it possible for us to understand how at a given level of development, intelligence takes up simultaneously all of the directions opened up in this field as a function of the potential transformations which characterize it as well as of the portions already structured. Piaget predicts that even if neurological considerations clarify his explanations at some later date, the structures of groupings, lattices and groups will reappear in this new perspective, resulting in the laws of equilibrium proving to be more general than when linked solely to behaviour patterns. Cybernetics currently permits the understanding of this linkage, since the problem in a homeostatic system proceeds by successive equilibration, within a system with a combinatorial structure (lattices) and essential laws of reversibility (regulations and groups).

4. Adolescent Thinking

Inhelder and Piaget (1953) in their jointly written chapter regret the bias towards pubertal effects in psychological investigations of adolescence and centre on the paucity of concern with adolescent thinking. In later elaboration (Piaget, 1967), Piaget acknowledges a 'characteristic affective colouration' during this period which causes a momentary disequilibrium, but considers that pubertal changes would play only a very secondary role if the thinking and emotions characteristic of adolescents were accorded their true significance.

With the realization that there is more to thinking than logic, Inhelder and Piaget suggest that the structural, logical transformations form a centre from which radiate the various more visible modifications of thinking which take place in adolescence. Although it can be postulated that the lattice and group structures are isomorphic with neurological structures and formal thought is likely to be a manifestation of the maturation of the nervous system, directly or indirectly related to puberty, the environmental milieu is of significance. The emergence of such structures is a product of progressive acceleration of individual development under the influence
of education. It is because formal thinking plays a fundamental role from the functional standpoint, that it can attain its general and logical structure. Logic is not isolated from life, it is no more than the expression of operational coordinations essential to action. The necessity to occupy an adult role results in conflicts which are not satisfactorily resolved in 'present-day' compensations and the adolescent adds to these limited compensations, a more general compensation of a motivation for change or even specific planning for change. There is participation in the ideas, ideals and ideologies of a wider group "through the medium of a number of verbal symbols to which he was indifferent as a child"; and the adolescent is committed to possibilities, building systems or theories. A conception of life is formulated which allows opportunities for assertion and greater achievements than predecessors. However, there is manifestation of egocentrism in the failure to distinguish between the personal planning for a life programme and the perspective of the group to be reformed. Piaget (1967) further elaborates that adolescent egocentricity is manifested by belief in the omnipotence of reflection, as though the world should submit itself to idealtic schemes rather than to systems of reality: "it is the metaphysical age per excellence ......... the self is strong enough to reconstruct the universe and big enough to incorporate it". Decentration occurs when occupational or professional training commences, resulting in transformation from idealistic reforming to achieving.

Parallel to intellectual transformations are two affective innovations involving interindividual feelings being enriched by ideals and personality developing in relation to social roles and scales of values derived from social interaction, interlocking with the transformations of behaviour caused by the development of formal structures. Piaget considers affectivity to be the energetic force of behaviour, the structure of which defines cognitive functions, both being indissolubly united in the functioning of the personality. The notions of humanity, social justice (in contrast to interindividual justice which is experienced at the concrete level)
freedom of conscience and civic or intellectual courage are ideals which profoundly influence the adolescent's affective life.

D. CRITIQUE OF PIAGET'S LOGICAL MODEL

Wallace (1965), Bruner (1959) and Isaacs (1951) are among those who circumstantiate Tisher's (1962) comment that even Piaget's critics admit his genius. Wallace commenting on the paucity of work relating to the growth of logical thinking prior to the Inhelder and Piaget's work, describes the 1953 publication as "nothing short of a revolution" in the developmental study of logical thinking and Bruner considers the work "the most important yet to appear." Parsons and Milgram in their translators introduction consider that the work goes far beyond most of the earlier works in its attempt to isolate and describe the mental structures on which the reasoning processes are based. Ausubel and Ausubel (1966) regret that even Inhelder's and Piaget's pioneering work has not increased interest in adolescent intelligence.

Isaacs (1951) in a review of Piaget's "Traité de Logique" questions the adequacy of Piaget's logical model; he locates the multiple ambiguities and difficulties inherent in such notions as "and", "or", "not", "equals", "proposition", "implication", "truth", "not truth" and "validity" and considers that it is within Piaget's "ethos" to establish a psychological grasp of the complexities involved, although this would not of course fit into the framework of a calculus presented as a self-sufficient system. However, it would be within possibility for Piaget to provide the psychology basic to an adequate logic.

Inhelder and Piaget's discussion on adolescent thinking is considered by Parsons (1960) to be inadequate; details are not expounded and there is little clarification with respect to areas different from the experimental problems cited throughout the
book. In trenchant, logical criticism, Parsons considers that Piaget oscillates in his interpretation of the standard notation of propositional calculus and his use obscures certain features of inferences which logicians call logical. This in Parson's opinion vitiates the claim that propositional logic provides the essential structure of the final stage of logical development. He protests against the amount of ambiguity and obscurity in Piaget's use of logical symbolism. Further, that such notions as "reciprocity" and correlative are rather sophisticated relations of truth-functions and such a command would be dependent upon knowledge of formal logic. Empirical support for this criticism is provided by Gurnum, Thomas and Heitz, (1972) details of which are given later in this chapter.

Braine (1962) concludes that Piaget's theory seems to embody an epistemological confusion of the products of reasoning (for example, sentences containing signs of operation) with the process (unknown) through which the products are brought about. Endorsement to this view had previously been expressed by Lunzer (1960) when considering that logical structure and psychological processes are not necessarily identical and to deduce from the logical interdependence of certain concepts to their psychological relationship is a dangerous process. The psychological processes, fundamental to the cognitive development of children need separate examination. Inholder (1962) has stressed that Piaget's use of logical models in no way implies that he has decided in advance that the real thought of the child should conform to the laws which govern logical and mathematical structures. The models represent the ideal system of all possible operations and research supports the approximation, but not full attainment of mental structures, to these models. Inholder's support is considered by Wallace as insufficient refutation to Piaget's critics.

Stressing the logicians and psychologists objections to confusing
logic with thought, Newell and Simon (1972) show how logic contributes to information processing psychology through the representation of ideas by symbols and the consequent alteration in meaningful ways by precisely defined processes. A metaphorical use of the similarities between logical manipulation of symbols on the one hand and thinking on the other has a profound liberating influence upon modes of conceptualizing thought, problem-solving and decision-making processes. Symbol manipulation can refer to a much wider range of phenomena than simple deductive logic. Newell and Simon attempt to show how the problem-solver can be described and understood as an information processing system. Wallace (1958) favours the information-processing approach to the developmental problems posed by Piaget's work for providing the methodological breakthrough needed.

An indictment concerning Piaget's concept of equilibrium is forwarded by Bruner (1959). Considering Piaget's explanation to lack clarity, Bruner promotes a further definition of equilibrium based on Piaget's descriptions: "each stage of operational thinking develops its own internal consistency, its own compensatory reversibility and predictability by virtue of being based on a set of rules of operation and that these rules can be described as logical structures". Piaget's reflections on the effects of the immanency of the adult role are maintained by Bruner to be the potential dynamism in Piaget's system in contrast to the notion of equilibrium. Bruner elaborates that "logical structures develop to support the new forms of commerce with the world" and this accounts for the lack of development with respect to the "abstract gift" within intellectually underprivileged families. In counter-argument there would surely be relevance in stressing that Bruner's observation is an inherent factor in Piaget's concept of equilibrium. Of some pertinence here, is a report of data from Coleman (1974) which permitted a distinction between present and future identity: "it became clear that while
present identity ("who I am") remains relatively stable during adolescence, future identity ("who I will be") does not.

Ausubel (1964) also considers the explanation for the shift from concrete operational to formal operational equilibrium to be insufficient. In a later paper (1965) he postulates the combined influence of three concomitant and mutually supportive developmental trends to account for the transition. The subject develops a working vocabulary of transactional or mediating terms, which can be developed into meaningful propositions more readily related to cognitive structures and hence render them more meaningful in view of his growing fund of stable, higher-order concepts and principles encompassed by and made available within that structure. After many years of practice in meaningfully understanding and manipulating relationships with the aid of concrete-empirical properties, he gradually develops greater facility in performing these operations so that they can eventually be effective without relying on properties.

Flavell (1971) considers Piaget's concept of equilibration to be partly right, but considers clarification and specification are necessary, together with research, before being adopted as an explanatory construct. This would seem to be in concordance with Bruner's further elaboration that development will not emerge from Piaget's theory until he attempts to extend his "theory of tactics" into a broader theory of strategy that takes into account the objectives toward which thought is forced. To move in order to cope with the goal-striving necessary for a going life and further, to isolate the processes that develop neurotic defences and learning blocks. (Braham, 1965, suggests that the negative sanctions of intellect achievement in adolescent peer groups particularly among the lower-class and culturally deprived has a deterrent effect. Ausubel (1965) reports findings in this respect for Maori youth).
Elkind (1961) has detected more than potential dynamism in Piaget's formulations; he maintains that Piaget makes no separation between drives and cognitive structures. The appearance of new structures gives rise to new drives to exercise these structures and exercise is self-reinforcing through the production of function pleasure. In the course of being exercised, novel stimulation leads to the differentiation of new structures which in turn give rise to new drives in a continuous progression; this process is an integral part of equilibration theory. A similar contention is expressed by Hunt (1961), considering Piaget's principle of new accommodative modifications and new assimilative combinations of schemata to be sources of function pleasure which promote their rehearsal in practice play.

Piaget's outline of the stages of development is the centre of controversy, particularly in regard to a natural transition revealed by new modes of behaviour attributable to the emergence of a new intellectual level of operational structures, rather than as a conventional analytic device. Fauville (1956) suggests that the stages found in intellectual growth are not features of the child's development but are inherent in the logical and essentially hierarchical organization of the material presented. The view of nativists views young children as possessing all the processes of thought but regards Piaget as wrong in asserting qualitative changes; the differences are attributed to the lack of appropriate data to manipulate or knowledge by which to judge. (Isacs, 1930, gives several instances of logical thinking in very young children). Brown (1956) argues that the cognitive processes of adults are more abstract than children, only in the sense that they manifest more discriminative generalization. Hence he claims, that adults do not use a wider range of abstract concepts in their thinking but merely employ a more highly differentiated repertoire of
sub-categories within existing categories. However, if young children use generalization not requiring prior discriminative analysis, this can hardly be considered a form of abstract thinking. It also seems plausible to believe that adults also use a characteristic greater number of general categories (Wallace, 1969). McLaughlin (1963) considers that if the adolescent is able to retain up to eight concepts simultaneously he can carry out formal operations. Most fallacies in reasoning can be accounted for on the hypothesis that the problem being considered calls for the construction of more concepts than can be kept distinct in the immediate memory. Attempts to accelerate concept formation have not on the whole been successful: illogical behaviour continues even when young children have relevant knowledge.

Toulmin (1971) considers that before developmental psychologists can establish a general sequence of developmental stages they must have formulated the various physiological changes of limbs, organs and bodily mechanisms and attempted to form parallels with the behavioural capacities for bodily control, sequential behaviour, symbolization, internalization and problem-solving. The resulting stages even then will be not only arbitrary and normative, but there will be an overlap into ethics with respect to desirability and obligation, thereby forming an ethical ideal of human development. At best, defining stages can only be a descriptive convenience. Wallace (1972) advocates greater flexibility in research studies, with acceptance of the inevitability of inconsistencies and individual variations in subjects' responses and a consequent adjustment in the few criteria employed in identifying developmental stages. Piaget (1969) emphasizes the flexibility within his conception of stages and clarifies that each stage of development is not so much characterized by a fixed thought content, then by a certain power, a certain potential activity capable of achieving "such and such" a result according to the child's environment. He continues to maintain that common features can be determined and are "an index of the potential activity differentiating each stage from
...the other.

Ausubel considers that all the arguments involving the gradual, rather than abrupt transition; variability within and between cultures; fluctuations occurring over time; transition to the formal stage occurring at different ages for different subject fields and component sub-areas within a particular field, fail to cause serious doubt for the legitimacy of Piaget's stages. Providing a given stage occupies the same sequential position in all individuals and cultures and reaches equilibrium before the occurrence of the next stage, there in compatibility with the afore-mentioned conditions: the influence of genetic and environmental influences are being reflected. It is interesting to note that Bruner (op cit) postulates the presence of a stage beyond formal operations: from being "flat-headed" to "egg-headed", that is from being intelligent to being intelligent about intelligence. Riegel (1973) focuses on the failure of Piaget's interpretations to represent adequately the thought and emotions of mature and creative persons. He considers that for an interpretation of adulthood and aging, a return to the dialectic basis is necessary. Such a reorganization can proceed from any of the four major levels of development and introduces intras- and interindividual variations into Piaget's theory. Individuals may operate simultaneously or in short succession at different cognitive levels. "The ceaseless striving toward formal operations becomes inappropriate and ineffective for the level of dialectic maturity." Following Riegel's reflections, it would seem appropriate to recall Piaget's (1972) recent acknowledgment (already referred to in Chapter One) that from the cognitive point of view, the passage from adolescence to adulthood raises a number of unresolved questions that need to be studied in greater detail. Following empirical evidence of differing norms to those indicated from the Genevan subjects,
Piaget postulates that the less general distribution of formal structures could be due to the diversification of aptitudes with age.

C. REPLICATIONS AND EXTENSIONS OF PIAGET’S EXPERIMENTAL WORK

The formal stage of cognitive development is a period in Piaget’s theory that has received relatively little empirical attention. Inhelder and Piaget (1959) stated that formal thinking develops between the ages of 11 to 15 years with an equilibrium point being attained at age fifteen years. The direct empirical question is therefore concerned with the percentage of adolescents exhibiting formal thinking at the age of fifteen years or at other ages during adolescent or adult life. Jackson (1963), Tisher (1962, 1971), Lunzer and Punfrefy (1966) and Lovell (1961) reported fifty per cent or less of subjects manifesting formal thinking at the age of fifteen years. Lunzer and Punfrefy focus on the lack of ability of the less than five per cent of fifteen year old children of average intelligence successful in the balance situation to explain the principle of balance. Pupils who solved the problem using proportional reasoning did so quite mechanically – they multiplied and divided because the procedure gave them the right answer. None would find any sort of approximation to the law of moments. Lunzer and Punfrefy gain support for this finding from Lovell (op. cit.) and Jackson (op. cit.) who suggest that only bright pupils could interpret the situation even at fifteen years. With respect to younger children, Tomlinson-Kossey identified thirty-two per cent of eleven year old female subjects operating at the formal level; of the fifty, eight to ten year olds, with I.Q.’s 140+, in Lovell and Shields (1967) study, only ten per cent were at the level of formal thought; it was only rarely that Lovell’s “average-to-bright” junior school children reached the stage of formal thinking. Yudin (1965) and Kates and Yudin (1964) identified significant gains in the utilization of hypothesis
testing from twelve to fourteen years and in the study of Dulit (1972), no subject in the youngest fourteen year old average group functioned at the fully formal level on both tasks and only two out of the twenty-one subjects in one task. When relaxed criteria were adopted, i.e. reasoning corresponding to Piaget's Stage IIIb, the percentage rose by only nine per cent. Tomlinson-Kessay found sixty-seven per cent of female college undergraduates functioning at the formal level (although this dropped markedly to twenty-three per cent when more stringent criteria were applied) with the fifty-four year old female sample revealing a percentage of fifty-four. Ross (1975) was in agreement with Tomlinson-Kessay's findings that a college-educated sample has significantly more than fifty per cent of the subjects functioning at the formal level, however percentages were less at the most developed stage for formal thinking. Griffiths (1974) reports that only thirty-nine per cent of college students scored at the Stage IIIB level. Dulit (1972) found twenty-five percent of average seventeen year old adolescents to function at the fully formal level together with thirty-three per cent of the adult group (20-55 years). Sixty per cent of the gifted sixteen to seventeen year old subjects were fully operational; seventy-five per cent in the case of boys. These studies therefore suggest that formal operations can be attained at very different ages but none of the studies detract from the essential validity of Piaget's formulations.

Lovell's (1961) study was one of the earliest extensive follow-up studies involving ten of Piaget's experiments with two hundred subjects between eight and eighteen years, together with ten training college students and three adults. Lovell considered that the main stages in the development of logical thinking proposed by Inhelder and Piaget were confirmed, although the least able secondary pupils remained at a low level of logical thought even at fifteen years, a finding not reported
by Inhelder and Piaget. Lovell reports considerable agreement between the levels of thinking that the subjects displayed in the four experiments (details are given later in the section dealing with statistical investigations). The majority of the protocols showed much the same kinds of reasoning as evidenced among the Swiss subjects and supported many of the Geneva findings. However, Lovell illustrates a comparatively lower incidence of spontaneity and sophistication and speculates that Inhelder and Piaget have somewhat forced the development of the child's thinking into a theoretical framework, but this does not detract from the provision of valuable insight.

Beard (1962) achieved almost diametrically opposed results to those of Lovell. From the pendulum experiment, Beard concluded that there was no evidence of clear-cut stages corresponding either with age or intelligence and that younger children may reach the higher stages; information and science teaching (or lack of it) appeared to influence the responses. In the shadows experiment the results agreed somewhat more closely with those of Inhelder and Piaget. However, some of the younger subjects were more advanced than their Genevan counterparts and there were a substantial number of older subjects who despite good intelligence and science teaching were non-characteristic with respect to formal thinking.

Dulit (op. cit.) considers that his study contains results which generally support, but which "significantly qualify" some of the central themes of Inhelder and Piaget's formulations. In the group of average older adolescents, only twenty to thirty-five per cent functioned at a fully formal level with the same "modest" percentages applied to the "spot check" of a small group of average adults. In order to find consistently higher percentages it was necessary
to turn to increasingly select groups; seventy-five per cent of scientifically gifted. Duit comments that the
formal stage appears to differ appreciably and significantly from the earlier Piagetian stages in which full development
appears to be the rule, whereas at the formal stage it appears as the exception. Although Inhelder and Piaget give the
impression that formal thinking is the rule in adolescence, nowhere in their work is the explicit claim that all (or
even most) adolescents actually function at the fully formal level. Duit in personal communication with Inhelder confirms
that indeed not all cases were reported. The orientation involved the description and formulation for the first time, of
the characteristics of the formal stage; there was no intention to speak to the frequency or incidence. Protocols
were used simply as illustration. Duit concludes therefore, that there is no real conflict between the results of his
study and the essentials reported by Inhelder and Piaget. Further, that the formal stage is therefore more of a
characteristic potentiality only sometimes becoming an actuality. The introduction into the model of at least some
other concept such as "dropout" rate or "branching" into parallel tracks, representing the development of alternative
patterns of thought involving only partial or minimal development of the capacity for formal thought appears to be necessary.
The Piagetian formulation gives too little attention to variations within the formal stage, to be a functioning psychological reality.
(Piaget's 1972 acknowledgements op. cit. offers some support for Duit's reflections). It can be speculated that one explanation
for the low occurrence of fully-developed formal stage functioning in the normal population compared to the incidence
of earlier stages is due to the lack of demand for such development. The lack of concrete level functioning in some primitive societies
lends further credence to speculation concerning some connection between the "demand function" of the society and the degree to
which the potential for each stage is actualized. It is of
some pertinence here to note that Dasen (1972) emphasized the
accumulating evidence from cross-cultural studies with respect
to the non-attainment of concrete operational thought in
subjects aged from twelve to eighteen years and further, the
studies of Goodnow (1962), Paluffo (1967), Howe (1969) and
Kelly (1970) lend credibility to Piaget's prediction (1966,
p.13; 1969, pp. 97-99) that the reasoning of primitive peoples
would not develop beyond the stage of concrete operations
(Berry
and Dasen, 1974).

Bynum, Thomas and Weitz (1972) challenged Inhelder's and
Piaget's claim that all sixteen binary operations of truth-
functional logic are used by a fully developed operational
thinker. Bynum et al. note that the evidence that the
sixteen are fully employed is based on a single protocol from
the Invisible Magnetism task. Representing logicians and
developmental psychologists, repeated unsuccessful attempts
were made to find or devise expressions in everyday language
that correspond to six of the specified operations namely:
nonimplication, inverse of converse implication, inverse of
independence of q in relation to p; inverse of independence
of q in relation to p; complete affirmation or complete negation.
During several years of teaching and studying logic, the
specified operations were not observed except in technical logic,
where the expression consisted of logical symbols. College
students of logic, even while solving complex problems used only
a few of the most common truth functional operations, and never
the specified six. After studying Inhelder and Piaget's scoring
procedure, it was concluded that eight of the binary operations
were not correctly interpreted and the evidence for their existence
was not discernible. They therefore question the use of the
sixteen binary operations of fully developed formal operational
thinkers and the suitability of the task of Invisible Magnetism
for the detection of such a use. Weitz et al. in a replication
of Inhelder's and Piaget's results with respect to the sixteen
binary operations with a random sample of 57 subjects from nine to sixteen years found none of the subjects used more than five of the sixteen operations, and that there was no developmental trend with regard to the number of operations used. A trend was manifest, however, since the more developed reasoner used the same operations as the less developed reasoner, but in a more complex and sophisticated manner.

Yudin (1964, 1965, 1969) and Kates and Yudin (1964) intent to determine the role of age and intelligence in concept attainment among twelve, fourteen and sixteen year old adolescent males, have indicated that twelve year olds of average intelligence were significantly less efficient than either the fourteen or sixteen year olds of average intelligence and followed a significantly greater number of strategies consistent with the concrete operations of the preadolescent. The older subjects of average intelligence did not differ among themselves but when compared with the younger subjects followed a significantly greater number of strategies which reflected the proper use of hypothesis formation and testing characteristic of late adolescent and adult thought. The subjects of low intelligence however, showed a different pattern, with the sequence of development indicating no significant changes from age twelve to age fourteen, but significant changes from age fourteen to age sixteen. For the high intelligence sub-group, the results pointed to almost linear development with increasing age being positively correlated with increasing efficiency. Thus, even at age twelve, the high intelligence sub-group was functioning at or above the level that the middle intelligence sub-group failed to reach until age fourteen. The age of commencement of formal thought in high intelligence subjects and the "ceiling" for gains in efficiency were further challenges to Kates and Yudin. The 1964 study presented relevant information for the latter with the indication that in the role of memory in concept attainment among college students, all college students,
seventeen to nineteen years, performed at a level superior to that reached even by the sixteen year old high intelligence subjects. Although the concept of mental age breaks down at sixteen, it is important to consider the intelligent adolescent and adult as a dynamic and developing individual, rather than remaining static at sixteen years. At the converse level, it is of relevance to note Jackson's study (op. cit.) in which the E.S.N. children showed very little increase in scores beyond the age of nine years and there was suspicion of deterioration between thirteen and fifteen years.

Inhelder and Piaget's work does not differentiate between the sexes and in this respect research findings have been ambiguous. Ross reports a significant difference among undergraduates and considered his findings to support Elkind's (1962) social role hypothesis, that formal tasks differentiate between the sexes because of the adolescent female's aversion to science, particularly as the females were equal to or superior to males in general intelligence measures. Duit (1972) reports that boys functioned at the fully formal level significantly more frequently than girls. For the three older groups, the percentages for boys were from twice to four times as great as those for girls. Field and Cropley (1959) noted the superiority of the boys in the development of formal operations between sixteen and eighteen years and Graybill from eleven to fifteen years. However, Tisher (op. cit.) and Saarni (1973) report no sex differences.

Neimark and Slotnick (1970) commenting on the importance of language at the later levels of thinking, centre on the lack of evidence with respect to the development of understanding of such fundamental language elements as quantifiers (all, some) and connectives (or, and) in the context of logical statements. The investigators administered an English translation of two of
the tasks of Nitta and Nagano (1966) involving logical connectives and replicated the major findings. Inclusion and exclusion were understood by a majority of even the youngest children of nine years; intersect (conjunction) was understood by a majority of all but the youngest children and union (disjunction) was not understood by the majority of the subjects except at the College level. This difficulty in dealing with disjunction confirms the contentions of Piaget and Inhelder and further caused Neimark et. al to speculate that there may be difficulty in the understanding of the word "or". The meaning of 'and' is learnt quickly with no ambiguity, however "or" is often used in an exclusive sense of "one or the other but not both": conceivably the subject may not be conversant with the inclusive interpretation. Neimark (1970) attempted to trace in a group of pupils aged fifteen to eighteen years, the development of the understanding of logical connectives and to illuminate the reasons for the apparent late appearance of the comprehension of "or". Analysis revealed that this comprehension develops during this age range and errors suggested that dealing correctly with disjunction requires formal operations, errors resulting from the application of inadequate concrete operations. The description form of the test indicated that "or" was not used spontaneously by the majority of the subjects despite the recent completion of a test in which the word appeared eight times. "Except" or "all but" were also infrequent. Jones (1972) examined the performance of two groups discrepant in verbal ability on three tasks designed to assess formal operational reasoning. The sample consisted of twenty-two pairs of grade 6 boys. Each pair was matched for intelligence but discrepant with respect to verbal ability and the use of tentative statements. Two Piagetian tasks were used together with a relatively language-free problem-solving task. Boys who were deficient in verbal ability and who used few hypothetical statements in speech showed no less ability to think
in hypothetical terms than did boys who had more verbal facility. Such findings support Piaget's contention that the level of cognitive development is not dependent on concurrent language development. Speech variants are not directly related to formal operational reasoning — while elaborated speech variants may well be more effective as a vehicle for communicating propositional reasoning, they are not to be viewed as being a prerequisite for such reasoning. Additional exemplification is provided by Furth commenting in 1969 that propositional operations are manifestly closely tied to the exercise of verbal communication and further that an advanced stage of development without the use of language cannot be envisaged, advocates the study of intellectual development in deaf persons. Furth and Younis (1971) using tasks based on the Piagetian model, assessed the functioning of deaf persons beyond the stage of concrete operations. The study indicated the facilitating effect of linguistic use on certain formal operations expressed in a symbolic medium. Furth interprets that it is the figurative medium for symbolic statements that causes language to be more closely related to formal than to concrete operations.

Saarni (op. cit.) focused on the contentions of Simon and Newell (op. cit.) that a theory of human problem-solving should answer questions relating to prediction of performances on specified tasks; give explanations of the problem-solving process; demonstrate how changes in the conditions of the problem-solver or the task alter problem-solving behaviour, i.e. explain how specific and general problem-solving skills are learned or acquired developmentally and predict incidental phenomena that accompany problem-solving. Therefore Saarni's objective was to compare problem-solving performance among formal-operational, transitional and concrete-operational subjects with the effect of relative field independence (Vitkin's theory of cognitive style). The results indicated individuals classified as formal operational (or transitional) were generally more competent problem-solvers on the productive thinking
problems than the concrete-operational subjects. Thereby, Saarni claims to have provided an overall theoretical framework from which to understand and interpret differences in complex deductive problem-solving performance. Dulit (op.cit.) emphasizes differences in problem-solving style for those subjects failing to function at fully formal level. 'Standard method types' lacked the power of formal-stage thought for the solution of new problems but adapted the problem at hand to some standard problem with standard solutions. Dulit considers this to be adequate for "everyday life", particularly with respect to the fact that many of the students ranked at the top of their class in a difficult and selective school. Inspirational subjects, occurring more commonly among subjects in an average school, would leap to a solution, but could give little by way of explanation. Tending to be "arts and letters" students, they were probably concerned in cultivating other aspects of themselves. These dual types fit with Hudson's (1965) convergent and divergent cognitive styles. Dulit considers that the optimal formal-stage function might be identified with some balance (equilibrium) between divergence and convergence especially since Piaget quite explicitly identifies the Combinatorial Matrix as having the virtue of being the framework within which one can both focus down on a particular crucial combination and/or freely generate all possible relevant combinations. The subjects functioning at the fully formal level, manifested however, a more convergent style, suggesting either that they were influenced in that direction by the nature of the problems that call for a right answer or that the concept of the formal stage is more appropriate and useful as a model for convergent styles of thought as compared with divergent styles. Formal operations may in theory relate to divergent thinking but may not capture the naturally crucial features of that style.

Familiarity with the content of the task appears to facilitate the use of formal thought. Further, credibility appears to influence the situation. Lunzer (1965) points out that in the
experiment involving "falling bodies on an inclined plane,"
logical necessity and initial belief are concomitant, unlike
the experiment involving the "oscillation of a pendulum" where
initial belief suggests that weight must be a relevant factor.  
Lovell (1971) cites a study (not identified) at Leeds involving
female College students eighteen to nineteen years, many of
whom maintained that weight must be a relevant factor in spite
of their own evidence to the contrary. This initial belief
appeared to arise from the fact that there is always a weight
on a grandfather clock to give energy to the system. Other
work at Leeds suggests that there is a positive relationship
between attitude to subject matter and performance. Both concrete
and formal thought appear later in history than in many other
school subjects. Sticht (1971) comments that the factors of
familiarity, credibility and student attitudes are all interrelated
and they act in some unified way to permit the student to deal at
a formal operational thought level with given subject matter. He
postulates the hypothesis that whenever a person capable of formal
thought encounters an unfamiliar task, the probability of instances
of formal thought operations decreases. Sticht suggests there may
be ontogenetic development of thought structure which follows
Piaget's stages and subject-matter development of thought structures
following the same stages.

Cross-cultural studies such as Peluffo's (op. cit.) work in
Southern Europe suggest that combinatorial reasoning and
anticipatory thinking were strongly interfered with by an under-
developed milieu and by lack of schooling. Goodnow and Bethan
(1966) showed the poor performance of unschooled eleven year old
Chinese boys on a task involving combinatorial reasoning, although
they were able to conserve weight. Similar findings were noted by
Kimball (1968) in Malawi's and Lovell (1969) has raised the question
as to whether the traditional African cosmology retains the onset of
formal operational thinking.
Research has therefore shown that subjects from varying environments give results differing from the norms indicated by Inhelder and Piaget's pioneering sample. Piaget (1972 op. cit.) acknowledges these differences by suggesting that research has shown that generalizations cannot be made on the conclusions of the Geneva research which was perhaps based on a somewhat privileged population. However, he emphasizes that the original observations have been confirmed in many cases and seem to be true for certain populations. The difficulty lies in understanding why there are exceptions and whether these are real or apparent. It can be speculated that differences in the speed of development would be due to the quality and frequency of intellectual stimulation and that therefore development would occur between fifteen to twenty years rather than eleven to fifteen years or that it will never emerge; secondly, that aptitudes of individuals differentiate progressively with age, in which case, formal operations can no longer be characterized as a proper stage but would already seem to be a structural advancement in the direction of specialization. The most probable interpretation allows a reconciliation with the concept of stages and the idea of progressively differentiating aptitudes: that all normal subjects attain the stage of formal operations or structuring if not between eleven to fifteen years, in any case between fifteen to twenty years. However, they reach this stage in different areas according to their aptitudes and their professional specializations (advanced studies of different types of apprenticeships for the various trades); the way in which these formal structures are used however, is not necessarily the same in all cases. One of the essential characteristics of formal thought appears to be the independence of its form from its reality content. At the concrete level a structure cannot be generalized to different heterogeneous contents but remains attached to a system of objects or to the properties of those objects; a formal structure seems generalizable
as it deals with hypotheses. However, it is one thing to dissociate the form from the content in a field which is of interest to the subject and within which he can apply his curiosity and initiative and it is another to be able to generalize the same spontaneity of research and comprehension to a field foreign to the subject's career and interests. Therefore the passage from adolescence to adulthood raises a number of unsolved questions, particularly with respect to the possibility of demonstrating at fifteen to twenty years, as at previous levels, cognitive structures common to all individuals which will be applied or used differently by each person according to his particular activities. The analysis of probable processes of differentiation is required, involving ascertaining whether the same structures are sufficient for the organization of many varying fields of activity allowing differences in the way they are applied or whether there are new structures still remaining to be discovered.

With respect to attempts to train formal operations, Lovell (1971) summarizes that the scattered and fragmentary evidence available is consonant with the view that training on tasks involving thought has little transfer value before the age of thirteen years. Lovell specifically refers to a study (not identified) at Leeds in which training was given heuristically. It was only among the thirteen year olds in a modified and more complicated form of the balance task in which more variables were isolated. Lunzer and Coombs (1969) used guided instruction designed to assist subjects at the ages of seven, nine, eleven and thirteen years in realizing the importance of holding constant all variables not under test and to arrive at an adequate realization of the scope of a combinatorial system through the presentation of three Piagetian situations at points previously revealing inadequate reasoning. When confronted three months later with variants of the testing situation, together with a new problem - the results showed
quite marked advantages to the taught subjects, changes being most apparent in the oldest age group. Lunzer and Coombs suggest tentatively that formal reasoning may be defined in terms of ability to profit from instruction. Siegler et al. (1973) attempted to teach ten and eleven year old subjects to solve Inhelder and Piaget's pendulum problem. The results replicated Inhelder and Piaget's observation that ten and eleven year olds do not often solve the pendulum problem unaided, but their inference that the student's cognitive developmental level would not allow benefit from instruction, was not supported. Tomlinson-Keesey (op. cit.) incorporated training with female subjects, eleven, nineteen and fifty-four years according to the individual's current level of cognitive development involving conflict between existing structures and reality together with active participation. The training led to a significant increase in the performance of all age groups on the immediate post-test, but there was a lack of generality to the delayed post-tests. An interesting feature was that the fifty-four year old woman progressed less after training than the older groups and were less likely to maintain a training effect. Tomlinson-Keesey speculates about the areas in which formal operations are being assessed and concludes that it is certainly possible that applying the operations characteristic of formal thought to different areas is a life-long endeavor. Sticht (1971) suggests that it is not to be concluded that the development of stages cannot be accelerated, but rather that discovery methods may not be appropriate. He alternatively suggests didactic approaches, systems principles, task analysis and synthesis and the importance of stating clearly and distinctly the instructional goal to be attained.

F. STATISTICAL INVESTIGATIONS OF FORMAL OPERATIONS

Although studies reported previously have as a matter of course involved statistical analysis, it is of relevance to focus on a selection of studies primarily concerned with applying statistical
techniques to analyse various Piagetian claims.

Of pertinence here is a study by Docherty (1974) who was intent to examine the developmental qualitative differences noting that previous efforts have tended to focus on the tasks themselves, Docherty's perspective was to discover whether individual children can be identified as primarily concrete or formal operational on the basis of their performance on Piagetian tasks. It was realized by Docherty that theoretically "perfect" patterns (i.e. pass all concrete tasks, fail all formal tasks) are seldom seen and that variability is meaningful within the Piagetian model in terms of horizontal desalage (that is that a child might pass only a few of several concrete operational tasks because of differences in the content of the tasks, Inhelder and Piaget (1964) or that with formal tasks a child may be more adept in some areas than in others (Piaget, 1972, op.cit) With the notion that the model is only of educational usefulness if relatively homogeneous groups of children identifiable as "concrete-operational" or "formal-operational" can be obtained, Docherty attempted to determine if groups of concrete and formal operational children could be identified through the technique of cluster analysis using a battery of five concrete and five formal tasks. The study provided "general, indirect support for the Piagetian model of qualitative differences in development" and suggested that it is possible to form groups of children which are relatively homogeneous from a Piagetian view and further illustrated the use of cluster analysis as a means of identifying such groups, a task which has in the past been largely arbitrary in terms of the items and criteria used for the grouping process.

Gyr et al. (1967) formulated three quasi-formal models of inductive behaviour, based on an inductive problem, representing the features of pre-operational, concrete-operational and formal-operational thinking, together with exploration of their various
properties. Each of the models was written as a computer programme, allowing the computer to simulate each model in turn and to have it respond in terms of the event probabilities generated by that model. The possibility of inducing the models of cognitive behaviour in adult populations by experimental conditions designed to evoke one or the other of them was also explored. Behaviour sequences generated by a live subject being fed into the programme for each model. The data suggested that a) the models generated behaviour sequences which were relatively unique to each model and b) that they have a certain degree of face validity in that they are sensitive to given experimental conditions in adult populations and also relate to ontogenetic development. The findings also suggested that the models for inductive behaviour may, as was hypothesized, be quasi-formal expressions of the cognitive stage descriptions proposed by Piaget. Bart and Airasian (1974) following a method of generating task hierarchies (ordering theory) to seven Piagetian tasks confirmed that success on concrete operational tasks is a necessary pre-requisite to success on formal operational tasks.

"Given the theoretical stance that formal operations are highly interrelated; for they have a unified structural basis", Bart (1971) inferred a "psychometric counterpart" of this hypothesis; namely, that formal operational skills are unifactor. He cites the longitudinal study of Hughes (1965, op. cit.) and focuses on the principal components analysis with the four Piagetian tasks and the discernment of a general component for formal operational skills. He further acknowledges the substantiation of a large general factor inherent in formal operational skills by Lovell and Butterworth (1966, op. cit.) and by Lovell and Shields (1967, op. cit.) Lovell and Butterworth using a principal component analysis found "a central intellective ability" to underlie tests involving proportion. Lovell and Shields demonstrated first principal component correlations with respect to the three Piagetian tasks. Bart administered four Piagetian formal thought tasks
(Oscillation of a Pendulum, Conservation of Motion on a Horizontal Plane and Equilibrium in the Balance), three formal operational reasoning tests and a test of verbal intelligence to ninety scholastically above-average adolescents at three age levels (13, 16 and 19 years). The formal reasoning tests involved the areas of biology, history and literature. Following principal component analysis and a 'maximum likelihood factor analysis' results indicated that "though the array of formal operations is conceptualized as a structure d'ensemble, formal operational skills have a bifactor structure". In this bifactor structure, the first factor was very substantial and was considered to be the formal operational factor, with the second relating to the content factor due to its separating the tasks from the test.

Though two of the tasks tested combinatorial reasoning, two the schema of proportion, and the formal reasoning tests, hypothetico-deductive reasoning, the second factor did not show differences among these reasoning modes but revealed differences among the contents for the measure. Thus it may be contended that formal operational skills set in a given content are unifactor. Bart continues "given that formal operational activities can be meaningfully classified according to their contents, it may be that this factor structure ... reveals information as to the nature of horizontal decalage at the stage of formal thought. An individual who is capable of applying formal operational skills to tasks within a given content (e.g. semantic content) would be more apt to apply formal operational skills to other tasks within the same content than to tasks in a content in which the individual has not applied formal operational skills." However, it is possible that there may be other relevant dimensions along which to separate formal operational skills. A further finding involved the component indicating formal thought to correlate modestly with measures of verbal intelligence. Ward (1972) concludes that "Butch and Slim" (details of which are given later in this Chapter) together with a number of parallel forms might well allow a test of the
unidimensionality of formal operations.

Lovell (1951) using Kendall's Coefficient of Concordance ($\gamma$) as the index of stability of the level of pupils thinking with ten of the experiments of Inhelder and Piaget found considerable agreement; the value of $\gamma$ varied from .89 to .62 depending upon the age and ability range of the 192 subjects aged eight to eighteen years. In addition, to determine if the experiments were drawn from the same population of experiments, the Kruskal Wallis one-way analysis of variance by ranks was used, providing some evidence for assuming that eight of the ten experiments are drawn from the same population of experiments. Jackson (1965) found ten subjects to be at the same substage within his battery of experiments and a further twenty-nine had answers included within two sub-stages; thus just over seventy per cent gave responses within two or less sub-stages.

Meiimerk (1970) states that there is no direct evidence for the existence of "structures" as Piaget describes them, as being consolidated at progressively higher levels of abstraction. Although Inhelder and Piaget report the results of a number of studies of tasks asserted to be diagnostic of formal operations thinking 'which may or may not have been run on the same subjects — there is no evidence of the intercorrelations among these tasks which would support the assumption that they do in fact, reflect a coherent structure'. Meiimerk therefore attempted to provide evidence for the intercorrelation among tasks of correlation, combination of chemicals and a problem-solving task. Meiimerk concluded that formal operations tasks used in the study were correlated but questioned the appropriateness of the combination of chemicals tasks.

Hathaway with respect to concrete operations confirmed that performance on Piagetian measures bear a modest, positive degree of relationship to performance on traditional measures considering the evidence to clarify the two types of measures to be neither totally distinct nor totally identical. Both measures contribute
to a general intelligence factor. However, the uniqueness of the Piagetian tasks and the aspects of the mental development they reflect and richness was revealed, together with the overwhelming and dominant concurrent association of Piagetian factors with measures of school achievement points the way to new and possibly more valid and reliable predictors and developmental aids to children's achievement. Further, relationships remained stable over time.

Studies reaffirming that Piaget tests measure some aspects of intelligence (probably a general intellectual factor) also measured by psychometric tests but which stress that they also measure something unique, include among others Dudek et. al (1969) and Kohlberg (1963) who reports intertask consistency of Piaget levels representing a general Piagetian factor independent of any general intelligence factor entering into the 'Binet'. Kohlberg also draws upon this finding in concluding that Piagetian measures reflect general increments in cognitive development due to natural (indexed by chronological age) or educational experience better than psychometric findings. Kohlberg and De Vries (1969) tentatively conclude that there is a consistency in Piagetian tasks that is relatively distinct from the consistencies found in psychometric tests and further that there is an additional component of consistency in Piagetian tasks that is related to psychometric performances and which helps to extend the concept of general intelligence. Stephens (1969) study of retardates and normals report significant correlations of WISC verbal IQ, Performance IQ and Full Scale IQ with Piagetian tasks of reasoning (including one formal-operational task) given to subjects from six to eighteen years - thus suggesting a general intelligence factor. However, the fact that few correlations were .60 or higher although reliabilities were high, strongly suggested that Piagetian reasoning tasks generally assess intellectual processes different from those assessed by Wechsler Scales. The fact that Piagetian measures defined three factors, not one factor supports the notion of a multidimensional structure of intelligence.
in Piagetian assessed areas as in the more traditional areas.

G. OTHER APPROACHES TO THE STUDY OF FORMAL OPERATIONS

The various references throughout this chapter to the importance of investigating formal operations in areas other than those investigated by Inhelder and Piaget have received support from the work of Peel and his students (1959, 1960, 1971, 1973). Peel emphasizes the importance of the ability to make effective judgements for appropriate action, endorsing the views of Inhelder and Piaget with respect to adolescent thinking that the adolescent conceives of possibilities beyond the limits of the environment and that they are impelled to the opinion and action which characterizes their lives by a drive to reconcile the actuality of their existence with the possibilities they themselves envisage. Concentrating upon verbal situations to assess the maturity of thinking, Peel reports that this interplay does not appear to be predominant until after thirteen and a half years for answers involving thinking beyond the evidence given in the presented passage are not prevalent before this age. Other research at Birmingham has given support to these findings: Rhys (1964) investigating adolescent thinking in terms of geographical material; Davies (1964), Readings (1963), the difficulties in choice and rejection of hypothesis in practical science problems; Thomas (1966) in archaeological material; Richmond (1973) among others emphasizes the importance of formal operations for religious education and Lodwick (1958) inferences drawn from historical passages.

With respect to the promotion of mature judgements, Peel cites the work of Suchman (1954, 1955) who initiated "learning to think" sessions in which pupils were encouraged to inquire and discover concepts autonomously. Biran (1968) constructed a successful learning programme which demonstrated the designing of experiments, the testing of hypotheses and the drawing of
conclusions. Gray (1970) found that adolescents subjected to programmed texts for training judgement, obtained higher scores on thinking problems. Anderson (1967) administered instruction in thinking to pupils and the results showed a considerable influence on the maturity of judgement. Stones (1965) gave programmed instruction in relevant historical concepts and increased the maturity of historical judgement in a group of secondary pupils. Peel (1967) discusses the possibility of using the actual responses obtained in the investigations of person's judgements as a means of teaching individuals how to judge.

Case and Collinson (1962) attempted to establish whether the inferences that secondary modern school children and pupils in further education draw in history, geography and literature texts correspond to the formal operational stage of reasoning. They concluded from the evidence that it can be reasonably stated that children of fifteen, with average intelligence, will have reached equilibrium of formal thought. They focused on the finding that children of matching CA and MA had differing scores of formal thought and emphasize that another factor or factors contribute to formal thought. Cultural background, width of experience and verbal repertoire may contribute to the development of formal thought operations. The incidence of regression to the intuitive level was high and they conclude that the occurrence is due to lack of verbal repertoire. Case and Collinson consider that Piaget's theory of structures of thought was substantiated but the appearance of formal thought in the Junior group leads to the questioning of age divisions. Field and Cropley (1969) were intent to clarify the relationship between science achievement and four cognitive style variables: mental operations, originality, flexibility and category width. A significant relationship was found to exist between formal operations and science.
Bart (1972) reports the construction and validation of formal reasoning tests which were used as part of the testing battery described in Bart, 1971, op. cit. The multiple-choice reasoning items involved the specification that the task for each item required a simple deduction, through use of logical rules of inference in order for the validly deducible response to be recognized, therefore fulfilling the Genesan specification for formal reasoning items. Bart concluded that the attempt to construct and validate paper and pencil formal reasoning tests was "somewhat successful". Burgess (1963) investigated the subject's ability to solve formal problems, his appreciation of the structure of the problem and his power to perceive what information was relevant and what irrelevant to the solution of the problem and attempted to externalize thinking through written group tests in three different ways: problem-solwing; to make up another problem of the same kind and the writing of problems in a simpler form than problems were given containing irrelavancies. Burgess concluded that formal thinking cannot be regarded as an inevitable result of physical maturation and the following of traditional academic curricula.

Baumark and Lewis (1967) considering that most of the available research in formal operations has been concerned with the development of specific concepts, therefore designed an experiment to examine the development of logical thinking from a problem-solving task designed to be relatively content free and to provide objective quantitative measures of the quality of the subject's performance. The subject was confronted with an initial state of a problem having a finite number of solutions and was required to determine a correct solution by gathering information with which to eliminate inappropriate
alternative solutions. The findings confirmed previous studies of conceptual development, with younger subjects performing at essentially a random or nonlogical level, with an increasing improvement with age. Cyr and Fleisher (1967) in connection with an inductive problem-solving apparatus, found only fourteen per cent of University students to manifest behaviour compatible with the formal operations model. When induced to solve the problems in as few trials as possible which forced them to use logical inferencing, fifty per cent showed behaviour favouring the formal operations model, with only five per cent when a time factor was introduced. Near significant differences were found between the students and fourth graders and significant differences between fourth and ninth graders.

Ward (1972) describes the later stages in the development of a series of reasoning items for the Operational Thinking Sub-Scale of the new British Intelligence Scale. 'Butch and Slim', a logical game, is based upon the combinatorial of the sixteen binary propositions and represents an attempt to integrate developmental material into a factorial framework. 'Butch and Slim' does not require the subject to produce hypotheses about a phenomenon, but to test the truth values of propositions already supplied against a rule or logical condition. The results broadly justified the rationale adopted for the items, an outstanding feature being clear developmental trends in the ability to carry out operations involving negation. Promising evidence as to reliability and validity emerged, although a number of substantial modifications to the items have been suggested. Ward and Pearson (1973) attempted to study the effects of variation of content on sets of items similar in administrative procedure and logical form, employing 'Butch and Slim' and a parallel "shape game". The relative ease with which many of the earlier "Shape Game" items were accomplished gave clear evidence of the effects of a variation of content. Reported speech (in "Butch and Slim"), involving additional linguistic transformations, may have provoked more errors in the required propositional thinking, together with emotional and attitudinal factors involved in the
use of 'human' characters. Ward and Pearson conclude that logical games merit the attention they are receiving in science and mathematics teaching and in research in child development, but share considerable misgivings over the operations of formal logic as a behavioural universe and as a source of stable discriminative items. Content appears to be crucial, suggesting that any general theory of human reasoning must include an important semantic content.
CHAPTER THREE

THE COGNITIVE - DEVELOPMENTAL APPROACH TO MORALITY

A. INTRODUCTION

B. PIAGET'S DEVELOPMENTAL CONCEPTION OF MORALITY

C. KOHLBERG'S COGNITIVE - DEVELOPMENTAL THEORY OF MORALIZATION

D. THE IMPLICATIONS OF KOHLBERG'S GENETIC STUDIES FOR PHILOSOPHIC ETHICS

E. FROM THOUGHT TO ACTION

F. CRITIQUE OF KOHLBERG'S THEORY

G. FURTHER EMPIRICAL VALIDATION OF KOHLBERG'S WORK

H. KOHLBERG'S APPLICATION OF HIS THEORY TO THE SPHERE OF MORAL EDUCATION
THE COGNITIVE - DEVELOPMENTAL APPROACH TO MORALITY

A. INTRODUCTION

As has been evidenced in the previous chapter, Kohlberg can be considered a leading exponent with respect to the development of moral judgment and it is therefore predetermined that this chapter will deal with an elaborated account of Kohlberg's developmental theory of moral judgment. However, in order to give full explanation to Kohlberg's theory it is necessary to place his argument within the context of the various psychological approaches to the broader category of moral development.

The study of moral development has long been recognized as a key problem area in the social sciences, as indicated by McDougall's (1908) statement that "the fundamental problem of social psychology is the moralization of the individual by the society" or by Freud's (1930) conjecture that "the sense of guilt is the most important problem in the evolution of culture." However, it appears difficult to make clear distinctions between moral development and the broader area of social development and socialization. Hoffman's (1970) comprehensive review of the research literature relating to morality indicates that moral development viewed as the particular aspects of socialization involved in internalization (i.e., learning to conform to rules in situations that arouse impulses to transgress and that lack surveillance and sanctions), have been approached from the behavioral, emotional and judgemental perspectives.

A behavioral criterion of internalization is that of intrinsically motivated conformity, or resistance to temptation. Such a conception is implicit in "moral character" which formed the basis of earlier research on morality; Hartshorne and May (1928-30) defined moral character as a set of culturally defined virtues, such as honesty, which could be measured by observing the child's ability to resist the temptation to break a rule (for example, against cheating) when it seemed unlikely that he would be detected or punished.

A second criterion of the existence of internalized standards is the emotion of guilt, that is, of self-punitive, self-critical reactions of remorse and anxiety after transgression of cultural standards. Both psychoanalytic and learning theories of conscience have focused upon guilt as the basic motive of morality.

In addition to conduct that conforms with a standard and to emotional reactions of remorse after transgression, the internalization of a standard implies a capacity to make judgements in terms of that standard and to justify maintaining the standard to oneself and to others. This judgemental form of moral development has constituted the focus of the work and theory of Piaget (1932), later elaborated by Kohlberg (passim). A major section of research therefore seeks to answer the problems of moral development by examining how socialization factors,
such as amount, type and conditions of punishment and reward, or opportunities for identification with parents, are related to individual differences in resistance to temptation, guilt or moral judgement.

Kohlberg (1964, 1968a, 1969) centres on the limitations of the study of internalized socialization in deciphering the classical problems of moral development. Internalization does not represent a clear dimension of temporal development; experimental measures of resistance to temptation (honesty) do not indicate any clear age trends toward greater occurrence of honesty from the preschool years to adolescence; projective measures of the intensity of guilt or moral anxiety also do not indicate clear age trends, except in terms of rather rapid and cognitively based age changes in the years 8 to 12, and these changes are in the direction of defining moral anxiety as a reaction to moral self-judgement rather than to more diffuse external events. While clear trends of development have been found in moral judgement, these trends cannot in the same sense be considered as internalized socialization. Further, a distinctive set of socialization factors has not been found that can be considered as an antecedent of moral internalization: research results suggest that the conditions which facilitate moral internalization (e.g. parental warmth) are the same conditions which, in general, facilitate the learning of nonmoral cultural rules and expectations. The findings of Hartshorne's and May's (op. cit.) studies of moral character suggested that honest behaviour is determined by situational factors of punishment, reward, group pressures, and group values, rather than by an internal disposition of conscience or character. Kohlberg concludes: that to the extent that human resistance to temptation is not general across situations to which a moral rule pertains and must therefore be predicted by purely situational factors, it would not seem to be expedient to describe human behaviour as the result of conscience. Consequent studies of morality have generally attempted to cope with Hartshorne's and May's findings by defining moral internalization in terms of superego, rather than "moral character." Researchers have recognized that moral action was not the direct result of an internal disposition toward honesty or moral character and instead have assumed it to be the result of a complex balance of internal and external forces, including strength of drives aroused by temptation, defenses against these drives, situational fears, group pressures etc. However, one distinctively moral force, guilt, was assumed to be a major determinant of action in situations of moral conflict or temptation. The disposition to feel guilt was assumed to be the result of early childhood identifications and experiences of punishment, rather than situational forces. Accordingly, while moral behaviour might be situation-specific, it might still be possible to isolate a general process of moral internalization or guilt formation having the same childhood
antecedents regardless of the particular moral situation involved. However, subsequent research on parental antecedents of guilt and of resistance to temptation has usually indicated that the child-rearing correlates of children's resistance to temptation in one situation are not correlates of resistance in another, and further the child-rearing correlates of projective test measures of guilt have not proved to be correlates of actual moral behaviour. Finally, projective measures of guilt have failed to consistently predict actual resistance to temptation behaviour. (reviewed in Kohlberg 1963a, 1964). Kohlberg (1964, 1968a) argues that this more recent research evidence is consistent with the Hartshorne's and May's findings by suggesting that the variables leading to resistance to temptation arise primarily from the situation rather than from fixed habits, character traits like honesty, or permanent superego dispositions to feel guilt. Following Burton's (1963) analysis of honesty, however, it can be agreed that there is some personal consistency in honest behaviour or some determination of honest behaviour by general personality traits. These traits, however, do not seem to be traits of moral conscience but rather a set of ego abilities corresponding to common-sense notions of prudence and will. In a tradition of moral psychology arising from the associationists and utilitarians, moral character is believed to result from practical judgement or reason. In this view, moral action (action based on rational consideration of how one's action affects others) requires much the same capacities as does prudent action (action based on rational consideration of how it affects the self's long range interests). Kohlberg (1968a) elaborates that "both require empathy (the ability to predict the reactions of others to action), foresight (the ability to predict long range consequences of action), judgement (the ability to weigh alternatives and probabilities), and capacity to delay (delay of response and preference for the distant, greater gratification over the immediate, lesser gratification)." In psychoanalytic theory, these factors are included with other aspects of decision-making and emotional control in the concept of ego strength. Some of the ego abilities which have been found to correlate consistently with experimental and rating measures of children's honesty include intelligence (IQ), delay of gratification, and stability and persistence of attention in simple experimental tasks. However, these findings suggest that honesty can be predicted as successfully from an individual's behaviour in cognitive-task or other nonmoral situations as from situations involving honesty, leading to the implication that the study of moral behaviour in terms of early experiences centering on specifically moral training of honesty, guilt, etc., is less likely to be profitable than is a study of moral behaviour in terms of more general experiences relevant to ego development and ego control in nonmoral contexts.
However, Kohlberg (op. cit.) stresses that while there is the suggestion that moral action can be determined by nonmoral situational and personality forces, there are also findings suggesting the determination of action by specifically moral values. He however, emphasises that this should not be taken to mean that there is any direct correspondence between conformity of verbal moral beliefs or attitudes and conformity of moral action. He refers to his own researches for evidence that there is a considerable correspondence between maturity of moral values (the possession of rational and internal reasons for moral action) and maturity of action in moral-conflict situations. "Clear relations between maturity of moral judgement and mature moral action are found in situations in which social norms are ambiguous or conflicting and in which developmentally advanced values clearly predispose toward one course of action rather than another."

Kohlberg considers that Hartshorne's and May's limited correspondence between age-linked measures of moral knowledge and experimental measures of honesty, occurred because they defined moral knowledge largely in terms of verbal conformity of attitudes, rather than maturity of moral reasoning and because resistance to cheating is not clearly a developmentally more mature choice or a choice based on moral reasons in the young age group studied. The evidence of Kohlberg's collaborators suggests however, that resistance to cheating does become a more mature alternative at older ages or higher levels of development, than those involved in the Hartshorne and May study. This occurs however at the level in which not-cheating may be defined as relevant to principles of contract, trust and equity. (Kohlberg refers to studies by Krebs, 1967 and Brown et. al., 1969, described later in this chapter within Section E: "From Thought to Action").

Kohlberg (1969a) concludes that evidence suggests that the basic social science problem of moral development is not that of accounting for individual differences in moral character as revealed in behaviour. Moral behaviour that involves conformity to social rules is, on the whole, to be explained as the result of the same situational forces, ego variables and socialization factors that determine behaviours which have no direct moral relevance. A more distinctive focus of analysis centres instead upon the direct study of the development of moral values, judgements and emotions. The study of actual conduct becomes relevant to problems of moral development because research is able to find links between the child's conduct and the development of his moral values and emotions. The pursuit of the origin of distinctively moral concepts and emotions in the child; the extent to which the child's development indicates typical or regular trends of change in these concepts and sentiments; the causes of stimulation of these developmental changes and the extent to which these developmental changes in moral concepts and
attitudes are reflected in developmental changes in the child's moral action under conditions of conflict or temptation, appear to be relevant in connection with moral development.

Prior to embarking on an exposition of the cognitive-developmental approach to the aforementioned pursuits, it is appropriate to refer more specifically to the related issue of the development of morality in cultures. Most recent psychological as well as sociological thought has assumed that the problem of the origin of moral values is a cultural problem: morality being viewed as a system of rules and values defined by the culture and acquired by the child through general cultural - transmission mechanisms such as reinforcement learning or identification. This culturological approach to moral development was first clearly outlined by Durkheim (1893-1911; 1925) who based it on assumptions about the cultural relativism of moral values which are still widely held. Durkheim developed his position out of a critique of the utilitarians (e.g. Hume, 1751 and Mill, 1861) who assumed that moral values were the product of individual adults, possessed of language and intelligence, who judged the actions of other individual men. The utilitarians suggested that actions by the self or by others whose consequences to the self are harmful (painful) are naturally deemed bad and arouse anger or punitive tendencies, and actions whose consequences are beneficial (pleasant) are naturally deemed good and arouse affection or approving tendencies. Logical tendencies lead these judgements of consequences to take the forms of judging that not right which does the greatest good for the greatest number.

In his critique of the utilitarians, Durkheim pointed to the following four phenomena: (a) Morality is basically a matter of respect for fixed rules (and the authority behind these rules); not of rational calculation of benefit and harm in concrete cases. (b) Morality seems universally to be associated with punitive sentiments, sentiments incompatible with the notion that the right is a matter of human-welfare consequence; (c) from group to group there is wide variation as to the nature of rules arousing moral respect, punitiveness and the sense of duty; (d) while modern Western societies divorce morality from religion, the basic moral rules and attitudes in many groups are those concerning relations to gods, not men and hence do not centre on human-welfare consequences.

The psychological origin of moral attitudes according to Durkheim, is in the individual's respect for the group, the attitudes shared by the group, and the authority figures who represent the groups. The values most sacred to the individual are those which are most widely shared by, and most closely bind together the group. Although Durkheim's views have been widely questioned, the essential implications have been widely accepted and assumptions common to Durkheim and Freud underlie the research studies of moral internalization previously
discussed. Unlike Durkheim, Freud derived moral sentiments and beliefs from respect for, and identification with, individual parents, rather than from respect for the group. Furthermore, Freud derived this respect and identification from instinctual attachments (and defences against these attachments) and viewed the central rules of morality as deriving their strength and rigidity from the need to counter these instinctual forces. In spite of these differences, Freud agreed in viewing morality (superego) as fundamentally a matter of respect for concrete rules which are culturally variable or arbitrary, since these rules are a manifestation of social authority, and he agreed in viewing punitive (or self-punitive) sentiments towards deviation as the clearest and most characteristic expression of moral internalization or respect.

As will be expounded later, Kohlberg's research shows that individual moral judgement seems incompatible with either of the extreme views contrasted. Moral judgments and decisions in all cultures appear from Kohlberg's work to be a mixture of judgments in terms of individual human utility consequences and judgments in terms of concrete categorical social rules. Kohlberg emphasizes that the implications of his research oriented to a "developmentalist" concept of morality are that individual moral beliefs and sentiments involving universal principles not directly embodied in concrete social rules often develop and function at a level of conscious opposition and transcendence of group authority, as the utilitarians implied, but this development itself presupposes the development of respect for group authority discussed by Durkheim.

8. PIAGET'S DEVELOPMENTAL CONCEPTION OF MORALITY

In general, the developmental approach to moral psychology (Baldwin 1897; Mead 1934; McDougall 1908; Hobhouse 1906; Piaget 1932; Kohlberg passim) has attempted to mediate between the extreme positions represented by the utilitarians and by Durkheim. Moral judgement and emotion based on respect for custom, authority and the group are seen as one phase or stage in the moral development of the individual rather than as the total definition of the essential characteristics of morality as for Durkheim. Judgement of right and wrong in terms of the individual's consideration of social-welfare consequences, universal principles and justice is seen as a later phase of development. This phase depends upon and integrates many of the emotional features of the earlier customary phase and does not spring directly from the minds of unsocialized rational adults as for the utilitarians. Both a morality of respect for social authority and an autonomous rational morality are to be understood as arising from the development of a self through the process of taking the roles or attitudes of other selves in interactions occurring in institutionalized patterns.
As elaborated in Piaget's developmental theory (1932), the child first moves from an amoral stage to Durkheim's stage of respect for sacred rules. This is not so much respect for the group as it is respect for the authority of individual elders such as the parents. Piaget considers that the cognitive limitations of the child of three to eight lead him to confuse moral rules with physical laws and to view rules as fixed external things, rather than as the instruments of human purposes and values. Piaget believes that the child sees rules as absolutes and confused rules with things because of his "realism" (his inability to distinguish between subjective and objective aspects of his experience) and because of his "egocentrism" (his inability to distinguish his own perspective on events from that of others). In addition to seeing rules as external absolutes, the young child feels that his parents and other adults are all-knowing, perfect and sacred. This attitude of unilateral respect toward adults, joined with the child's realism, is believed to lead him to view rules as sacred and unchangeable. Piaget explains that intellectual growth and experiences of role-taking in the peer group naturally transform perceptions of rules from external authoritarian commands to internal principles. In essence, he views internal moral norms as logical principles of justice. By "the sense of justice", Piaget means a concern for reciprocity and equality between individuals. However, norms of justice are not simply matters of abstract logic; rather they are sentiments of sympathy, gratitude and vengeance which have taken on a logical form. In accordance with Piaget, an autonomous morality of justice develops in children of about age eight to ten years and eventually replaces an earlier, heteronomous morality based on unquestioning respect for adult authority. He expects the autonomous morality of justice to develop in all children, unless development is fixated by unusual coerciveness of parents or cultures or by deprivation of experiences of peer cooperation.

Certain aspects of Piaget's theory have been supported by subsequent research findings, while others have not, (a comprehensive review is to be found in Rodgil, 1974). Piaget's stage theory suggests a number of cross-culturally universal age trends in the development of moral judgement. Among these are (a) intentionality in judgement, young children tending to judge an act as bad mainly in terms of its actual physical consequences, with older children judging an act as bad in terms of the intent to do harm; (b) relativism in judgement, the young child views an act as either totally right or totally wrong and thinks everyone views it in the same way, the older child being aware of possible diversity in views of right and wrong; and (c) independence of sanctions, the young child saying an act is bad because it will elicit punishment and the older child stating an act
as bad because it violates a rule or does harm to others. The young child's absolutism, nonintentionalism and orientation to punishment do not appear to depend upon extensive parental use of punishment. Even the permissively reared child appears to have a natural tendency to define good and bad in terms of absolutism and punishment, a tendency which his awareness of punishment by teachers, police and other parents seems sufficient to stimulate. While specific punishment practices or cultural ideologies do not appear necessary for the formation of the young child's moral ideology of punishment, they may lead to the persistence of this ideology into adolescence or adulthood. Specific cultural factors therefore appear to stimulate or retard age trends of development on the Piaget dimensions, but they do not appear to actually cause the age shifts or trends observed. Piaget appears to be correct in assuming certain characteristics of the young child's moral judgement in any society, characteristics which arise from the child's cognitively immature interpretation of acts labelled good and bad by adults, according to the derivation of their goodness from their association with good and bad consequences of physical harm, punishment and reward. However, his interpretation of these aspects of the young child's morality, as deriving from the child's sense of the sacredness of the rules and of adult authority has not been supported. Piaget (1932) attempts to demonstrate that the young child's attitude toward rules is one of unilateral sacredness by observation of children's behaviour and beliefs about the rules of the game of marbles. Swiss children are quoted as saying that the rules of the game can never be changed, that the rules have existed from the beginning of time and have been invented and handed down by God, the head of the state, or the father. Kohlberg (1969a) emphasises that his research suggests that attitudes of rigidity toward game rules seem to decline with age in American children of five years to twelve years, but that attitudes expressing the rigidity or sacredness of moral rules or of laws, increase in this period, rather than decline. From cross-cultural research by Kohlberg and his colleagues, Kohlberg concludes that Piaget is correct in assuming a culturally universal age development of a sense of justice, involving progressive concern for the needs and feelings of others and elaborated conceptions of reciprocity and equality. As this sense of justice develops, however, it reinforces respect for authority and the rules of adult society; it also reinforces more informal peer norms, since adult institutions have underpinnings of reciprocity, equality of treatment, service to human needs etc.
For more than sixteen years, Kohlberg has studied the development of moral judgment and character, primarily by following the same group of 75 boys at three year intervals from early adolescence (10 years) through manhood (up to 28 years) supplemented by a series of studies of development in other cultures and varying environmental conditions. These studies have led to the definition of moral stages as follows (as given in Kohlberg, passim) derived from responses to hypothetical moral dilemmas, "deliberately philosophical", some found in medieval works of casuistry."

DEFINITION OF MORAL STAGES

I. Preconventional level

At this level the child is responsive to cultural rules and labels of good and bad, right or wrong, but interprets these labels in terms of either the physical or the hedonistic consequences of action (punishment, reward, exchange of favours), or in terms of the physical power of those who enunciate the rules and labels. The level is divided into the following two stages:

Stage 1: The punishment and obedience orientation. The physical consequences of action determine its goodness or badness regardless of the human meaning or value of these consequences. Avoidance of punishment and unquestioning deference to power are valued in their own right, not in terms of respect for an underlying moral order supported by punishment and authority (the latter being stage 4).

Stage 2: The instrumental relativist orientation. Right action consists of that which instrumentally satisfies one's own needs and occasionally the needs of others. Human relations are viewed in terms like those of the market place. Elements of fairness, of reciprocity, and of equal sharing are present, but they are always interpreted in a physical pragmatic way. Reciprocity is a matter of "you scratch my back and I'll scratch yours," not of loyalty, gratitude, or justice.

II. Conventional level

At this level, maintaining the expectations of the individual's family, group or nation is perceived as valuable in its own right, regardless of immediate and obvious consequences.
The attitude is not only one of conformity to personal expectations and social order, but of loyalty to it, of actively maintaining, supporting and justifying the order, and of identifying with the persons or group involved in it. At this level, there are the following two stages:

Stage 3: The interpersonal concordance or "good boy-nice girl" orientation. Good behaviour is that which pleases or helps others and is approved by them. There is much conformity to stereotypical images of what is majority or "natural" behaviour. Behaviour is frequently judged by intention - "he means well" becomes important for the first time. One earns approval by being "nice."

Stage 4: The "law and order" orientation. There is orientation toward authority, fixed rules, and the maintenance of the social order. Right behaviour consists of doing one's duty, showing respect for authority, and maintaining the given social order for its own sake.

III. Postconventional, autonomous, or principled level

At this level, there is a clear effort to define moral values and principles which have validity and application apart from the authority of the groups or persons holding these principles, and apart from the individual's own identification with these groups. This level again has two stages:

Stage 5: The social-contract legalistic orientation, generally with utilitarian overtones. Right action tends to be defined in terms of general individual rights, and standards which have been critically examined and agreed upon by the whole society. There is a clear awareness of the relativism of personal values and opinions and a corresponding emphasis upon procedural rules for reaching consensus. Aside from what is constitutionally and democratically agreed upon, the right is a matter of personal "values" and "opinion." The result is an emphasis upon the "legal point of view," but with an emphasis upon the possibility of changing law in terms of rational considerations of social utility (rather than freezing it in terms of stage 4 "law and order"). Outside the legal realm, free agreement and contract is the binding element of obligation. This is the "official" morality of the American government and constitution.
Stage 6: The universal ethical principle orientation. Right is defined by the decision of conscience in accord with self-chosen ethical principles appealing to logical comprehensiveness, universality, and consistency. These principles are abstract and ethical (the Golden Rule, the categorical imperative); they are not concrete moral rules like the Ten Commandments. At heart, these are universal principles of justice, of the reciprocity and equality of human rights, and of respect for the dignity of human beings as individual persons.

Porter (1932) refers to recent speculation by Kohlberg on the possibility of a Stage Seven, based on "rational mysticism" traditionally examined by religion or metaphysics rather than the combined efforts of psychology and philosophy. Kohlberg cites examples of responses from a variety of cultures, e.g. Malaysian aboriginal, Taiwanese, to show how it is the distinctive form (as opposed to the content) of the child's moral thought which allows him to refer to the developmental sequence as being universal. Kohlberg (passim) claims to have found the same aspects or categories of moral judgement and valuing in all cultures. (Kohlberg (1971) elaborates that his notions of moral categories are derived from both the Piagetian psychological tradition and from traditional ethical analysis. Piaget's structural analysis of cognitive development is based on dividing cognition into basic categories such as logic, space, time, causality, and number, which define basic kinds of judgements, or relationships, in terms of which any physical experience must be construed: that is, it must be located in spatial and temporal coordinates, considered as the effect of a cause etc. Piaget's cognitive categories derive from Kant's analysis of the categories of pure reason, who also considered an analogous set of categories of pure practical reason, or of action under the mode of freedom.

Further, Kohlberg has received inspiration from Dewey's treatment of moral categories, which echoes Kant's distinctions. Kohlberg (1971) includes the following extract from Dewey (1905) to further clarify the origin of his aspects of Moral Judgement.

"The distinctively intellectual judgement construes one object in terms of other similar objects and has necessarily its own inherent structure which supplies the ultimate categories of all physical science. Units of space, time, mass, energy, define to us the limiting conditions under which judgements of this type do their work. The limiting terms of moral judgement (of the judgement construing an activity content in terms of each other)
constitute the characteristic features, or categories, of the object of ethical science, just as the limiting terms of the judgement which construes one object in terms of another object constitute the categories of physical science. A discussion of moral judgement from this point of view may be termed the "Logic of Conduct." Ethical discussion is full of such terms; the sensuous and the ideal, the standard and the right, obligation and duty, freedom and responsibility are examples." (p.22)

Kohlberg elaborates that the particular terms listed by Dewey have been termed "Modes", that is, terms defining functional kinds of moral judgment. Equally basic are "Elements" or Principles of Judgement", such as "Welfare", "Respect" and "Justice." Further, there are universal moral issues, or values (the application of the categories to content area or institutions) ranging from law to authority to life. Any given moral judgement may be simultaneously assigned to a mode, to an element and to an issue in Kohlberg’s scheme, with each mode, element, and issue being defined at each of the stages of development. Kohlberg’s table of the "Aspects of Moral Judgement" is reproduced as follows:

**ASPECTS OF MORAL JUDGEMENT**

I. The modes of judgement of obligation and value
   A. Judgement of right
   B. Judgement of having a right
   C. Judgement of duty and obligation
   D. Judgements of responsibility—conceptions of consequence of action or of the demands or opinions of others one should consider over and above strict duties or strict regard for the rights of others
   E. Judgement of praise or blame
   F. Judgements of punishability and reward
   G. Justification and explanation
   H. Judgements of nonmoral value or goodness

II. The elements of obligation and value
   A. Prudence—consequences desirable or undesirable to the self
   B. Social welfare—consequences desirable to others
   C. Love
   D. Respect
   E. Justice as liberty
   F. Justice as equality
   G. Justice as reciprocity and contract

III. The issues or institutions
   A. Social norms
   B. Personal conscience
   C. Roles and issues of affection
   D. Roles and issues of authority and democracy, of division of labour between roles relative to social control
   E. Civil liberties—rights to liberty and equality to persons as human beings, as citizens, or as members of groups
It is emphasized that the concept of stages implies something more than age trends. First, stages imply invariant sequence: each person moving step by step through each of the kinds of moral judgement outlined, with the possibility of moving at varying speeds and becoming fixated at any level of development. Kohlberg's longitudinal studies allowed the citing of the example of "Tommy", responding at Stage-1 at age 10, Stage-2 at age 13, and Stage-3 at 16 years. "Jim" was found to be responding at Stage-4 at age 16. Stage-5 at age 20 and Stage-6 at 24 years. Secondly, stages define "structured wholes", total ways of thinking, not attitudes toward particular situations. A stage is a way of thinking which may be used to support either side of an action choice, that is, it illustrates the distinction between moral form and moral content (action choice). Kohlberg emphasizes that correlational studies indicate a general factor of moral level which cross-cuts aspect, but it should however be noted that any individual is usually not entirely at one stage. Typically, as children develop, they are partly in their major stage (about fifty percent of their ideas), partly in the stage into which they are moving, and partly in the stage they have just left behind. Seldom, however, using stages at developmental removes from one another. Thirdly, a stage concept implies universality of sequence under varying cultural conditions: suggesting that moral development is not merely a matter of learning the verbal values or rules of the child's culture, but that it reflects something more universal in development, something which would occur in any other culture.

Research considered by Kohlberg to indicate the cultural universality of the sequence of stages, demonstrated that for middle-class urban boys aged ten in the United States, Taiwan and Mexico, the greater number of moral statements are scorable at the lower stages. In the United States, by age 16, the order is reversed, so that the greater proportion use higher stages, with the exception of Stage-6, which is rarely used. The results in Mexico and Taiwan are the same, except that development is a little slower, showing however, that Stage-5 thinking is not purely an American democratic construct. From two isolated villages, one in Yucatan, one in Turkey, the similarity of the pattern is considered by Kohlberg to be "striking." While conventional moral thought (Stages-3 and 4)
Increases steadily from age 10 to 16, at 16, it still has not achieved a clear ascendency over premoral thought (Stages-1 and 2); Stages-5 and 6 being totally absent. Trends for lower-class urban groups are intermediate in rate of development between those for the middle-class and the village boys. Kohlberg concludes that these studies suggest that the same basic ways of moral valuing are found in every culture and develop in the same order.

Kohlberg further reports that no important differences have been identified in the development of moral thinking between Catholics, Protestants, Jews, Buddhists, Moslems and Atheists. Children's moral values in the religious area seem to go through the same stages as their general moral values, and although both cultural values and religion are important factors in selectively elaborating certain themes in the moral life, they are not unique causes of the development of basic moral values.

The order of psychological adequacy of the stages is claimed by Kohlberg to have been empirically tested; the studies of Rest (Rest, Turiel and Kohlberg, 1969) form the core data which link the psychological explanations to issues of philosophic adequacy. In these studies, adolescents were first pretested with standard moral dilemmas, then asked to put in their own words, prepared arguments at each stage, "pro" and "con" a choice for each of two newly presented dilemmas. Typically, adolescents distorted arguments higher than their own moral stage into ideas at their own stage or one below. In contrast to such distortion downward of stages above their own, adolescents had no difficulty comprehending arguments below their own modal stage: all subjects understood all arguments at or below their own level. Some subjects understood thinking one and occasionally, two stages above their dominant or modal stage; they revealed however, some (twenty percent) use of the higher stages which they comprehended, indicating that they were already in transition to the higher stage. The major implication of these findings are that Kohlberg's stages constitute a hierarchy of cognitive difficulty with lower stages available to, but not used by those at higher stages. This order of cognitive difficulty does not however indicate an order of moral adequacy but Rest further found that his adolescent subjects perceived the statements for each stage as representing a hierarchical order of perceived moral adequacy: this was most clearly the case for the stages which they comprehended. The order of perceived "goodness of thinking" corresponds to the order of stages comprehended by the subjects. There was also a tendency to rank Stage-5 and 6 statements high, even when they were not comprehended, but it was much less clear cut. (Kohlberg, Kohlberg 1970b; 1971; and Rest, Turiel and Kohlberg 1969) speculates that this preference for stages not
comprehended, could be a Platonic intuition of a higher form of the good.

From this it was predicted that, "eliminating the stage at which he is, the subject should most assimilate moral judgements one stage above his own, and assimilate much less those which are two or more stages above, or one or more stages below, his own. These predictions have been clearly and consistently verified in different experimental studies (Turiel 1966; Rest. Turiel and Kohlberg 1969 and Blatt and Kohlberg 1969) A recent study by Rest et al. (1974) lends further credence to the stage hierarchy: using Kohlberg's moral stages, statements were written to exemplify stage characteristics. Subjects were asked to select the statement defining the most important issue in a moral dilemma. The importance attributed to principled (Stages-5 and 6) moral statements evidenced developmental trends, differentiating student groups of varied advancement and correlating in the 60s with age, comprehension of social-moral concepts and Kohlberg's scale, together with attitude measures. The more advanced subjects attributed more importance to higher stage statements and further, the correlations suggested that as subjects develop cognitively they come to define moral dilemmas more complexly and come to place greater importance on principled moral thinking than do the less cognitively advanced subjects.

Kohlberg emphasises that a cognitive-developmental theory of moralization holds that there is a sequence of moral stages for the same basic reasons that there are cognitive or logico-mathematical stages, that is, because cognitive-structural reorganizations toward the more equilibrated occur in the course of interaction between the organism and the environment. By "cognitive-developmental" Kohlberg elaborates that he refers to a set of assumptions common to the moral theories of Dewey and Tufts (1932), Mead (1934), Baldwin (1906, Piaget (1932) and his own (Kohlberg, passim). All these theorists have postulated:

"(a) Stages of moral development representing (b) cognitive-structural transformations in conception of self and society; all have assumed (c) that these stages represent successive modes of "taking the role of others" in social situations, and hence that (d) the social environmental determinants of development are its opportunities for role-taking. More generally, all have assumed (e) an active child who structures his perceived environment, and hence, have assumed (f) that moral stages and the structural features of the environment, leading to (g) successive form of equilibrium in interaction. This equilibrium is conceived as (h) a level of justice, with (i) change being caused by disequilibrium, where (j) some optimal level of match or discrepancy is necessary for change between the child and the environment."
The psychological assumption that moral judgement development centrally involves cognitive development is not the assumption that this is an increased "knowledge" of rules found outside the child, in his culture and its socialization agents. Studies of moral knowledge such as the Hartshorne and May study (op. cit.) indicate that most children know the basic moral rules and conventions of our society by the age of six-to-seven years. By insisting on the cognitive core of moral development, it is meant rather that the distinctive characteristic of the moral is that it involves active judgement. "Judgement is neither the expression of, nor the description of, emotional or volitional states, it is a different kind of function with a definite cognitive structure." Kohlberg elaborates that this structure of judgement as the child's use and interpretation of rules in conflict situations, and his reasons for moral action, rather than as correct knowledge of rules or conventional belief in them. Kohlberg (1971) describes his cognitive hypothesis to be basically, that moral judgement has a characteristic form at a given stage, and that this form is parallel to the form of intellectual judgement at a corresponding stage. This implies a parallelism or isomorphism between the development of the forms of logical and ethical judgement. By this it is meant that each new stage of moral judgement entails a new set of logical operations not present at this prior stage; the sequence of logical operations involved being defined by Piaget's stages of logico-mathematical thinking. (This aspect of Kohlberg's theory has received treatment in "The Statement of the Problem", Chapter One).

With respect to cognition and affect, Kohlberg considers that such discussions usually found under the assumption that cognitions and affects are different mental states. However, the cognitive-developmental view holds that "cognition" and "affect" are different aspects, or perspectives, on the same mental events, that all mental events have both cognitive and affective aspects, and that the development of mental dispositions reflects structural changes recognizable in both cognitive and affective perspectives. Kohlberg affirms that it is evident that moral judgements often involve strong emotional components, but this in no way reduces the cognitive component of moral judgement, though it may imply a somewhat different functioning of the cognitive component than is implied in more neutral areas. Kohlberg cites as an example

"An astronomer's calculation that a comet will hit the earth will be accompanied by strong emotion, but this does not make his calculation less cognitive than the calculation of a comet's orbit which had no earthly consequences. Just as the quantitative strength of the emotional component is irrelevant to the theoretical importance of cognitive structure for understanding the development of scientific judgement, so the quantitative role of affect is relatively irrelevant for understanding the structure and development of moral judgement."
Kohlberg acknowledges that this example however is misleading in that effective aspects of mental functioning enter into moral judgement in a different way than in scientific judgement. Moral judgements are largely about sentiments and intuitions of persons and to a larger extent they express and are justified by reference to the judger's sentiments. The development of sentiment, as it enters into moral judgement is, however, a development of structures with a heavy cognitive component. Kohlberg has identified empirical correlations between a child's stage on, for example, the life concept and on the guilt concept: thus a child's stage on the aspect "concepts of moral sentiments" correlates well with his stage on nonaffective concepts, and correlates about as well with IQ as do the nonaffective concepts. Kohlberg concludes that "the quality (as opposed to the quantity) of effects involved in moral judgement is determined by its cognitive-structural development", and is an inseparable component of the general development of the child's conceptions of a moral order. In elaboration:

"Two adolescents, thinking of stealing, may have the same feeling of anxiety in the pit of their stomachs. One adolescent (Stage-2) interprets the feeling as 'being Chicken' and ignores it. The other (Stage-4) interprets the feeling as "the warning of my conscience' and decides accordingly. The difference in reaction is one in cognitive-structural aspects of moral judgement, not in emotional 'dynamics' as such."

The centrality of role-taking for moral judgement is recognised in the notion that moral judgement is based on sympathy for others, as well as in the notion that the moral judge must adopt the perspective of the "impartial spectator" or the "generalized other." Kohlberg's empirical claims include the underlining of opportunities for role-taking, operating by stimulating moral development rather than producing a particular value system. In four different cultures, middle-class children were found to be more advanced in moral judgement than matched lower-class children: moving through the same sequences but moving at different speeds. Similar, but even more striking differences were found between "peer-group participators" (popular children) and "non-participators" (unchosen children). Kohlberg refers to studies in progress which suggest that these peer-group differences partly arise from, and partly add on to, prior differences in opportunities for role-taking in the child's family (family participation, communication, emotional warmth, sharing in decisions, awarding responses to the child, pointing out consequences of action to others etc.). Holstein (1971) found that the amount of parental encouragement of the child's participation in discussion (in a taped "revealed-differences" mother-father-child discussion of moral conflict situations) was a powerful correlate of moral advance in the child. "An explanation of differential moral advance in terms of role-taking is an explanation in terms of
The environment which provides role-taking opportunities is not necessarily a warm, loving, identification-inducing environment, and an environment deprived in role-taking opportunities is not necessarily cold or rejecting. A certain minimum amount of warmth in face-to-face groups or institutions is required if a child or adolescent is to feel a sense of participation and membership in the group. However, the conditions for a child's maximal participation and role-taking in a group is not that he receives maximal affection from the group, or that the group be organized on communal affiliation lines. At the extreme negative end, impersonal, cold environments are also deficient in role-taking opportunities.

In traditional orphanages, a large majority of children are still at the pre-conventional level at age 16 (Thrower 1971). At the more positive end (as environment promoting moral development) are both certain types of middle-class families and the kibbutz, not an especially warm or emotionally responsive or personal environment (Bar-Yam and Kohlberg 1971). Kohlberg (1964) discusses that affectional relationships (or identification) with parents are important in moral development, more because positive and affectional relations to others are generally conducive to ego development and to role-taking and acceptance of social standards than because they provide a unique and direct basis for conscience formation.

Role-taking tendencies and the sense of justice are interlocked. While role-taking in the form of sympathy often extends more broadly than the sense of justice, organized or "principled" forms of role-taking are defined by justice structures.

In order for roles and rules to represent a socio-moral order, they must be experienced as representing shared expectations or shared values and the general shareability of rules and role expectations in an institution rests centrally upon a justice structure underlying specific rule and role definitions. Because the central mechanisms of role-taking are justice structures of reciprocity and equality it can be suggested therefore, that institutions better organised in terms of justice provide greater opportunities for role-taking and a sense of sharedness than do unjust situations. The concepts of role-taking and justice, provide concrete meaning to the cognitive-developmental assumption that moral principles are neither external rules taken inward, nor natural ego tendencies of a biological organism, but rather the interactional emergents of social interaction. Piaget argues (as elaborated in "The Statement of the Problem", Chapter One) that just as logic represents an ideal equilibrium of thought operations, justice represents an ideal equilibrium of social interaction, with reciprocity or reversibility being core conditions for both logical and moral equilibrium.
justice would not develop without the experience of social interaction, it is not simply an inward mirror of sociologically prescribed forms of these relations, any more than logic is an internalization of the linguistic forms of the culture.

In Piaget's theory, closely followed by Kohlberg, the notion that logical and moral stages are interactional is united to the notion that they are forms of equilibrium, forms of integrating discrepancies or conflicts between the child's schema of action and the actions of others. Opportunities to role-take are opportunities to experience conflict or discrepancy between one's own actions and evaluations and the actions of evaluations of others. To role-take in a moral situation is to experience moral conflict: the conflicts of the wishes and claims of the self, the other and a third party or more. However exposure to higher stages of thinking presented by significant figures in the environment is probably neither a necessary nor a sufficient condition for upward movement: the studies of Turiel, and Rest, Turiel and Kohlberg (op. cit.) have led Kohlberg to presume that movement to the next stage involves internal cognitive reorganization rather than the mere addition of more difficult content from the outside. Turiel (1969) postulates that cognitive conflict is the central "motor" for the internal cognitive re-organization that upward movement to the next stage involves. Turiel is conducting a series of experiments presenting children with varying combinations of contradictory arguments flowing from the same stage structure. Turiel hopes to show that exposure to the next stage up, effects change not through the assimilation of specific messages, but by providing awareness that there are other, better, or more consistent solutions than the child's own, forcing him to rethink his own solution, thereby proving to be one of the environmental events promoting cognitive conflict. Exposure to real or verbal moral conflict situations not readily resolvable at the child's own stage, and disagreement with, and among significant others about such situations are other environmental effects being empirically tested in the moral discussion classes conducted by Blatt (Blatt 1969; Blatt and Kohlberg 1969). Blatt's findings suggest that the effects of naturally occurring moral discussions upon moral judgement be understood in the theoretical terms outlined, those of inducing cognitive conflict in the child, and subsequent reorganization at the next level of thinking.

Kohlberg's cognitive-developmental theory can be summarized as claiming that "(a) moral judgement is a role-taking process, which (b) has a new logical structure at each stage, paralleling Piaget's logical stages; this structure is best formulated as (c) a justice structure, which (d) is progressively more
D. THE IMPLICATIONS OF KOHLBERG'S GENETIC STUDIES FOR PHILOSOPHIC ETHICS

Kohlberg (1971) focuses on the "epistemological blinders" worn by psychologists, which have hidden from them the fact that the concept of morality is itself a philosophical (ethical) rather than a behavioural concept. He considers that it was due to his awareness of the necessity for orienting to philosophic concepts of morality when starting his psychological research that he has uncovered facts not previously noted. There was a failure to anticipate however, that an empirical developmental study could contribute to the solution of distinctively philosophic problems in both normative ethics and metaethics. It was because of a practical concern to develop his research implications into an active programme of moral education (Kohlberg 1970a, 1970b; Blatt and Kohlberg 1969) that he worried about the implications of his moral research for a definite ethical position. Kohlberg's 1971 Paper is therefore addressed to "From is (the facts of moral development) to Ought (the ideal content and epistemological status of moral ideas)." Kohlberg claims that his earlier, philosophic claim that the stimulation of development is the only ethically acceptable form of moral education, can be upheld regardless of his more controversial claim, namely: that the common assumptions of the cultural relativity of ethics is in error, promoting instead, that "ethical principles" are the end point of sequential "natural" development in social functioning and thinking, the stimulation of their development being a different matter from the inculcation of arbitrary cultural beliefs. As indicated in an earlier section of this chapter, this cultural relativity, on which almost all contemporary social scientific theorizing about morality is based, has influenced the sociological-role theorists, psychoanalytic theorists and learning theorists to view moral development and other forms of socialization as the direct internalization of external norms of a given culture. A second assumption, closely linked to the assumption of ethical relativity, being that morality and moral learning are fundamentally emotional and irrational processes based on mechanisms of habit, reward, and punishment, identification, and defense. (Kohlberg's full consideration of the empirical propositions derivable from the relativity postulation as being factually correct statements about variations in human moral behaviour and judgement, appears in Kohlberg 1971 pp. 155-63 and passim). In contrast to "extreme" and "sociological relativism", Kohlberg has empirically demonstrated that there are universal moral
concepts, values, or principles, and there is less variation between individuals and cultures than has usually been maintained, in the sense that almost all individuals in all cultures use the same thirty basic moral categories, concepts or principles; all individuals in all cultures go through the same order or sequence of gross stages of development, though varying in rate and terminal point of development. The marked differences between individuals and cultures which exist are differences in stage or developmental status.

Kohlberg affirms that his psychological theory as to why moral development is upward and sequential is broadly the same as his philosophical justification for claiming that a higher stage is more adequate or more moral than a lower stage. Both psychological and philosophical analyses suggest that the more mature stage of moral thought is the more structurally adequate. This greater adequacy of more mature moral judgement rests on structural criteria more general than those of truth value or efficiency. These general criteria are the formal criteria which developmental theory holds as defining all mature structures, the criteria of increased differentiation and integration: formal criteria synonymous with the formal criteria which philosophers of the formalist school have held to characterise genuine or adequate moral judgements. From Kant to Hare, formalists have stressed the distinctively universal and prescriptive nature of adequate moral judgement. The increasingly prescriptive nature of more mature moral judgements is, Kohlberg stresses, reflected in the series of differentiations described throughout the theory, "which is a series of increased differentiations of 'is' and 'ought' (or of morality as internal principles from external events and expectations)."

The claim of principled morality is that it defines the right for anyone in any situation; in contrast, "conventional morality defines good behaviour for a Democrat but not for a Republican, for an American but not for a Vietnamese". Conventional morality is not fully universal and prescriptive, and leads to continual self-contradiction; in contrast, principled morality is directed to resolving these conflicts in a stable, self-consistent fashion.

Kohlberg claims that the higher moral stage is the philosophically better although he accentuates that "claims of superiority" for higher stages are not claims for a system of grading the moral worth of individual persons. In Kohlberg's view, the basic referent of the term "moral" is a "type of judgement or a type of decision-making process, not a type of behaviour, emotion, or social institution". Kohlberg (1970a) elaborates: "For one man, a prohibition of parking is a moral norm, for another a mere administrative regulation. What makes it moral is not the legislation of the rule but the individual's attitude towards it". Kohlberg
emphasises that Stage-6 is a deontological theory of morality. He elaborates that "the three primary modes of moral judgement and the corresponding types of ethical theory, deal with (a) duties and rights (deontological), (b) ultimate aims or ends (teleological) and (c) personal worth or virtue (theory of approbation)"

Kohlberg emphasises that "claims of superiority, then, are claims for the superiority of Stage-6 judgements of duties and rights (or of justice) over other systems of judgements of duties and rights. We make no direct claims about the ultimate aims of men, about the good life, or about other problems which a teleological theory must handle. These are problems beyond the scope of the sphere of morality or moral principles, which we define as principles of choice for resolving conflicts of obligation."

Kohlberg continues: "the general criterion we have used in saying that a higher stages mode of judgement is more adequate than a lower stage is that of morality itself, not of conceptions of rationality or sophistication imported from other domains". Kohlberg acknowledges that a philosopher may not judge Stage-6 as more adequate than lower stages because it is not more scientifically true, is not more instrumentally efficient, does not reflect more metaethical or epistemological sophistication, or is not based on a "more parsimonious set or normative ethical postulates. Only a philosophical formalist who views morality as an autonomous domain, with its own criteria of adequacy or rationality, is likely to evaluate moral arguments by moral criteria rather than by philosophical criteria of rationality imported from nonmoral domains". In further explanation, Kohlberg states: "we are arguing that a criterion of adequacy must take account of the fact that morality is a unique sui generic realm. If it is unique, its uniqueness must be defined by general formal criteria, not our metaethical conception is formalistic. Like most deontological moral philosophers since Kant, we define morality in terms of the formal character of a moral judgement, method, or point of view, rather than in terms of its content. Impersonality, ideality, universalizability, preempptiveness, etc. are the formal characteristics of a moral judgement. These are best seen in the reasons given for a moral judgement, a moral reason being one which has these properties. But we claim that the formal definition of morality only works when we recognize that there are developmental levels of moral judgement which increasingly approximates the philosopher's moral form. This recognition shows us (a) that there are formal criteria which make judgements moral, (b) that these are only fully met by the most mature stage of moral judgement, so that (c) our mature stages of judgement are more moral (in the formalist sense, more morally adequate) than less mature stages" (Kohlberg 1971, p. 215).
Kohlberg therefore claims that developmental theory assumes formalistic criteria of adequacy and the criteria of levels of differentiation and integration. In the moral domain, these criteria are parallel to formalistic moral philosophy's criteria of prescriptiveness and universality. These two criteria combined represent a formalistic definition of the moral, with each stage representing full realization of the moral form. In conclusion, Kohlberg states: "To my knowledge, those who object to a formalist definition of morality have no positive alternative to offer except (a) morality is what is in accord with my own system, or (b) morality is relative. Regardless of psychology then, our conception of morality has a strong philosophical base. Anyone who tries to criticise it must provide a stronger positive alternative".

With respect to principles of justice Kohlberg expounds that the whole notion that there is a distinctively moral form of judgement demands that moral judgement be principled, that is, "that it rely on moral principle, on a mode of choosing which is universal, which we want all people to adopt in all situations". Mature principles are neither rules (means) nor values (ends) but are guides to perceiving and integrating all the morally relevant elements in concrete situations; guiding the resolving of claims which compete in a situation. All principles can be reduced to the single principle. (Kohlberg promotes eight "steps of argument for justice as the basic moral principle in Kohlberg 1970a p. 65 and "six arguments" in Kohlberg 1971, p.229).

In final summary, Kohlberg delineates that what is being claimed with respect to the relation of "is to ought" in moral development is that scientific facts reveal a universal moral form successively emerging in development and centering on principles of justice. Science can test whether a philosopher's conception of morality phenomenologically fits the psychological fact but cannot justify that conception of morality as what morality ought to be because the rules of scientific discourse are not the rules of moral discourse. However, science can contribute to a moral discourse as to why one moral theory is better than another. The scientific theory as to why people factually do move upward from stage to stage and why they factually do prefer a higher stage to a lower, is broadly the same as a moral theory as to why people should prefer a higher to a lower. "We have argued for a parallelism between a theory of psychological development and a formalistic moral theory on the ground that the formal psychological developmental criteria of differentiation and integration, of structural equilibrium, map into the formal moral criteria of prescriptiveness and universality. In essence there is a 'deep logical structure' of movement from one stage to the next, a structure tapped by both a psychological theory of movement and by families of philosophical argument. If these contentions are correct they provide a new definition of the moral philosopher's task, a definition more exciting than that implied by much recent philosophic work".
Kohlberg postulates that maturity of moral thought should predict maturity of moral action: that specific forms of moral action require specific forms of moral thought as prerequisites. The judgement-action relationship can be described as "the correspondence between the general maturity of an individual's moral judgement and the maturity of his moral action." Kohlberg's initial study (Kohlberg 1958) produced a product moment correlation of .46 between moral judgement scores and ratings of conscience. Experimental studies by Krebs (1967) and by Brown et al. (1969) bear these correlation trends out by revealing that principled subjects appear much less likely to cheat than conventional subjects. Conventional subjects referred to cheating in terms of maintaining social expectations and order, which carried no force when no longer supported by the group; the principled person defines the issue of cheating as one of inequality, of taking advantage of others, of deceptively obtaining unequal opportunity, that is, in terms of justice. Kohlberg claims that this interpretation implies that moral judgement determines action by way of concrete definitions of rights and duties in a situation. Kohlberg interprets this to imply that moral judgement determines action by way of concrete definitions of rights and duties in a situation.

Kohlberg argues that moral judgement dispositions influence action through being stable cognitive dispositions, not through the affective changes with which they are associated. He is claiming that the moral force in personality is cognitive. Affective forces are involved in moral decisions, but affect is neither moral nor immoral; when the affective arousal is channelled into moral directions, it is moral; when it is not so channelled it is not. The moral channeling mechanisms are cognitive principles defining situations, sorting out conflicting claims without distorting or cancelling them, leaving personal inclination as the arbiter of action.

"The study of the relation of social cognitive structures to social action seems in principle much like the study of the relation of physical cognitive structure to actions upon physical objects, including the fact that both take place in social fields". However, Kohlberg acknowledges that the issue of sacrifice raises a fundamental difference in the moral area: "Because much morality involves basic sacrifice, it has been consigned to the realm of the irrational by Nietzsche, Freud and Kierkegaard and their followers. If however, a mature belief in moral principle in itself engenders a sacrifice of the rational ego, apart from other personality and emotional considerations, we are faced with a conception of the rational end of cognitive structure which has no parallel in the realm of scientific and logical thought."
Further studies providing validation for Kohlberg's "judgement-action relationship" include those of Haan, Smith and Block (1968); Rubin and Schneider (1973); Fodor (1972); and Mann (1973). Berkeley students faced with a decision to "sit-in" in the name of political freedom of communication were administered moral judgement interviews by Haan et al. Fifty percent of Stage-5 subjects and eighty percent of Stage-6 subjects were among those "sitting-in", while only ten percent of conventional level students were included. (An interesting phenomena in this study is that about sixty percent of students, termed by Kohlberg as "Stage-2 instrumental relativists" also sat-in. Kohlberg and Kramer (1969) report that in about twenty percent of college youths, the transition from conventional to principled thought is marked by extreme relativism accompanied by an apparent retrogression to Stage-2 instrumental hedonism. However the longitudinal study shows that all extreme relativists eventually move on to principled stages). Rubin and Schneider, using Lee's (op. cit.) adaptations of Kohlberg's moral approach reported a positive relationship between decentration skills as indicated by scores on measures of communicative egocentrism, moral judgement and altruism in seven year old subjects, thereby relating moral cognition to altruistic behaviour. Fodor (1972), following the administration of the Kohlberg interview to 40 delinquent and 40 non-delinquent adolescent boys, found delinquents received substantially lower moral judgement scores (significant at the .001 level) than did non-delinquents.

Kohlberg (1971a) cites that with respect to the My Lai shootings in Vietnam, the one man who refused to shoot any civilians during the massacre showed principled thinking in his reasoning about both My Lai and other moral conflicts. The public statements of other soldiers involved, indicated that they were at conventional levels, reasoning that it was necessary to shoot to obey orders. Mann (1973) reports an Australian survey of public attitudes relating to the My Lai massacre and the trial of Lieutenant Calley. Fifty-nine percent believed that the My Lai soldiers should be "pardoned" and thirty percent reported they also would have obeyed orders to shoot civilians. Subjects endorsing the "follow-orders" ideology were more likely to be older, less well-educated, at the lower end of the economic scale, politically conservative and authoritarian. Following further analysis, Mann had reasons to believe that the true level of obedience ideology in the population could be substantially higher than revealed by the data; thereby lending further credence to Kohlberg's indications that the majority of the population operate at conventional levels.
F. CRITIQUE OF KOHLBERG'S THEORY

Alston (1971) commenting on an earlier version of Kohlberg's 1971 paper considers that scrutiny of Kohlberg's descriptions of stages and assignment of subjects to stages reveals that what is being classified is what might be called a person's habitual style of moral reasoning. Alston points to a fundamental conceptual point about having a concept, on the one hand, and of using a concept (or habitually or typically using a concept) on the other. Therefore the hypotheses confirmed by empirical studies using these stage assignments, hypotheses concerning the cause and consequences of stage membership and stage transition, cannot themselves be construed as hypotheses about the causes and consequences of stages of conceptual development. A more direct demonstration would require the development of a test for possession of moral concepts, analogous to the test of typical mode of reasoning, leading to a further question of a parallel sequence between the acquisition of moral concepts and the adoption of a mode of reasoning.

Alston with respect to Kohlberg's claim that each stage involves a differentiation of its characteristic content from that of the preceding stage would suggest that this is contemporaneous with one's adopting ("or falling into") that mode of moral reasoning as dominant. He feels that Kohlberg has not presented adequate evidence for that claim. Many philosophers who are as conceptually sophisticated as Kohlberg's Stage-6 subjects take positions in moral philosophy that reflect Stage-4 or 5.

With respect to the concept of justice as a supreme moral principle; "a judgement based on a principle of racial destiny, or on no principle at all, can be just as prescriptive as a judgement based on an application of Kohlberg's principle of justice. Alston considers that Kohlberg met with only partial success in showing what he set out to illustrate, namely, that the facts of the order of moral development and its explanation reveal his Stage-6 of moral reasoning to be a morally superior way of resolving moral problems. The mere fact that one concept logically depends on another has no tendency to show that moral thinking involving the former is superior to moral thinking involving the latter. However, the evidence Kohlberg adduces goes far toward breaking down the popular contrast between factual and scientific judgement as objective, and moral judgement as subjective. It does at least strongly suggest that one's modes of moral judgement universally tend to develop in certain directions under the impact of objective dimensions of its subject matter". Alston considers that Kohlberg has enriched moral psychology and has opened a number of new perspectives which "should force psychologists to take the cognitive aspects of morality seriously as an important influence on behaviour". However, Kohlberg "has not been able to resist the temptation to overstate his case"; he tends to imply an insignificant
role for affect in moral life and further, he gives the impression that habits based on cultural norms and the concept of habit have no place in moral psychology. Alston argues that habit concepts are indispensable in psychology, moral or otherwise and Kohlberg's evidence does not prove to the contrary. With respect to affect one can "universally embrace the thesis that any distinctive emotional state will have a cognitive side, by virtue of which it is the kind of emotional state it is, and still insist that emotional states, to which an affective side is also essential, play crucial roles in moral development and moral motivation ......." Alston suggests that Kohlberg's concentration on moral dilemmas in his research leads to his emphasis on reasoning as against affect and habitual response, "both in terms of relative contributions to the determination of behaviour and in terms of phenomenological prominence........ Thus one may see the neglect of the affective and the habitual as, in part, a sort of 'methodological artifact' ........."

In similar vein to Alston, Peters (1971), in addition to considering that Kohlberg's argument that moral development occurs as a result of interaction between the child and his physical and social environment is inadequate, refers to Kohlberg's contention that specific character traits, such as honesty, which function as habits are of little significance in the moral life. Peters considers that it parallels Kohlberg's claim that learning theorists have produced no evidence of the influence of early forms of habit training on adult behaviour (Kohlberg 1966). This lack of importance assigned to habit goes against a whole tradition of thought about moral development stemming from Aristotle. Peters expands that it is not the case that habits have to be formed by a process like that of a drill: learning habits in an intelligent way, can be regarded as providing an appropriate basis, in the moral case, for the later stage when rules are followed or rejected because of the justification that they are seen to have or lack. In addition to intelligent rule following, Peters feels that young children can become sensitive to considerations which will later serve them as principles. Justice is a difficult abstract consideration for young children and if instead of justice, concern for others was encouraged, "it can come to function later on as one of the fundamental principles of morality. Further, Peters considers Kohlberg nowhere deals with the development of the class of virtues involving self-control: namely to be tempted, or to be made fearful. Familiarity with such situations carry over into situations in later life when the proper reasons for being courageous can be appreciated. Habituation is important both in familiarizing children with the features of such situations and developing the relevant action patterns that will enable them to deal practically with the emotions that may be aroused instead of being overcome: "habituation may thus help
to lay down a pattern of response that may be used in the service of more appropriate motives at a later stage". Peters asks whether Kohlberg thinks that an individual can adhere to "his favoured principle of justice ....... without some training". Peters also refers to the "disposition to act": on a broader view of "reason", it becomes readily apparent that there are a cluster of "passions" closely connected with it, without which its operation would be unintelligible. Passions such as "abhorrence of the arbitrary, the hatred of inconsistency and irrelevance, the love of clarity and order and the determination to look at the facts". Kohlberg's reliance, like Piaget's, on the intrinsic motivation to assimilate and accommodate to what is novel reveals a great difference between sporadic curiosity and the passions which cluster round the concern for truth. The question of how children come to care finds no clear answer in Kohlberg's writings.

Peters concludes that Kohlberg's account of moral development might be considered to be one-sided, in that it has been erected on the features of a limited interpretation of morality: any moral system in which justice is regarded as the fundamental principle cannot be applied without a view, deriving from considerations other than those of justice, about what is important. To propose any criteria about what is just implies evaluation and this "opens up obvious possibilities for alternative emphases in morality in addition to those already mentioned". Peters considers that Kohlberg's findings are of unquestionable importance but "there is a grave danger that they may become exalted into a general theory of moral development....." Peters considers that Freudian theory far from providing a competing theory of moral development is providing a much needed supplement to the work of the Piaget-Kohlberg school.

Simpson (1974) in considering the methodology and interpretation of findings which are specific to Kohlberg's cognitive-developmental research believes that it will serve as a focus for examining more broadly some of the problems of cross-cultural studies in any field "not just the emotion-laden one of morality". She considers that one of the difficulties of Kohlberg's work is that although developing parallel and in some senses, isomorphic philosophical and psychological statements of cognition and morality, he does not make clear the empirical sources of his claims to universality in the empirical realm. The distinction between normative philosophy and empirical psychology remains blurred, and normative thinking especially governs the description of what he calls empirically derived categories of "post-conventional" or "principled" reasoning. The related research only tentatively supports the claim of an invariant developmental sequence and Simpson does not accept the related studies of Turiel (1966 op. cit.) and Rest (1969 op. cit.) as being conclusive. She emphasises that Kohlberg's "cosmopolitanism is hemispheric" for
view, Western and Eastern philosophies differ far more between themselves than within, both in substance and methodology, Western philosophy does not represent systems of thought common to the entire world.

Simpson considers that like each of us, Kohlberg's interest in cognitive development and moral reasoning, his choice of a Kantian or Deweyan infrastructure for his theory and his predilection for abstractions of such principles of justice, equality or reciprocity are all in a sense accidents of time and place and the interaction of his personality with a specifiable social environment and the norms of the subgroups within that environment. His rebuttal to those who emphasise cultural differences is "more a statement of faith than an evidence-based conclusion". Universality is far from confirmed from the limited cross-cultural studies reported and further, if principled reasoning as defined by Kohlberg does not occur in some cultures, then one third of the paradigm is missing and the assumption that, under different conditions, these stages would appear in these groups is not necessarily warranted. Simpson further refers to the fact that post-conventional reasoning, presupposes the capacity to perform formal operations of abstract thought. She refers to the empirical parameters of formal thinking being defined by cultural manifestations and what Piaget (1972) terms "extremely disadvantagous conditions" which may delay its appearance to 20 years of age and indeed even prevent its appearance. (Piaget 1972 has been discussed in "The Statement of the Problem"- Chapter One). If formal operational thinking - a precondition for principled reasoning does not occur in every culture, it seems illogical to expect principled moral reasoning to appear universally. Simpson further focuses on findings such as those of Ross (1973, discussed in Chapter - One) which point out that fewer than fifty percent in adolescent samples are able to achieve this level of reasoning. Simpson states; "the ascendency of the normative philosopher over the empirical scientist becomes very clear in Kohlberg's acknowledgement that his Stage-6 describes a utopian ideal rather than a reality". This is in response to Kohlberg's statement:

"There is a universal set of moral principles held by men in various cultures, our Stage-6. (These principles, we shall agree, could logically and consistently be held by all men in all societies; they would in fact be universal to all mankind if the conditions for socio-moral development were optional for all individuals in all cultures). In responding to written and oral interviews based on situations and issues, a very small percentage of subjects studied in a number of cultures utilize the reasoning processes and the principled content which I prefer to think is the highest developmental stage of which human beings are capable, and which I believe all should utilize and would under specifiable conditions."
acknowledges that cultures and individuals may be systematically described as to their stage or developmental status, however, "Kohlberg leans a little farther into philosophy and assumes a judgmental, normative stance which is in danger of toppling him out of scientific psychology entirely".

With respect to principled thinking Simpson considers that the principles displayed may simply be the learned values of a different and smaller reference group so well internalized that its members believe themselves to be functioning autonomously: "in some groups, internality - in the sense of autonomy in respect to the dominant culture - is learned as a norm, and admission and continued membership are contingent upon that knowledge. Further, Simpson considers that the language used in the protocols of Stage-5 and Stage-6 subjects raises other questions about the structural aspects of the moral development interviews. There is a dependence on the capacity to refer to hierarchies and principles, to universal ideas, and especially to concepts such as justice, equality and reciprocity at a high level of abstraction. Simpson finds it difficult to believe that Stage-6 subjects are not functioning independently of their socialization, that they must have been very thoroughly socialized into the company of intellectual elites who value and practice analytic abstract and logical reasoning. Highly abstract concepts such as justice have so little commonality in meaning from one group to another as to be practically useless as cross-cultural generalizations: concept development simply does not mean the same thing from one class or culture to another; for example, the concept of equality has a wide range of specific meanings which is affected by class membership.

Further, the series of issues, selected because they are deemed to have universal applicability are questionable: the issue of property rights is prone to cultural differences as is the value of life prone to the same ambiguities; "in every group it is not that life is valued overall or not valued, but that it is valued situationally in highly culturally-specific ways" and is not a matter of natural and universal knowledge. Simpson believes that Kohlberg’s (1969) suggestion that Stages-4, 5 and 6 could be viewed as alternative types of mature moral responses, rather than as a sequence "would relieve some of the tension caused by the attempt to define the higher three stages as culture-free and universally attained through normal development. It would also render the hierarchy a typology and represent the stages (at least above the first three) as lateral, rather than vertical growth so that the present pious loading should be shovelled off/principled reasoning".
G. FURTHER EMPIRICAL VALIDATION OF KOHLBERG'S WORK

Grimley (1974) in a cross-cultural study of moral development involving subjects from Zambia, United States, Hong Kong, Japan and England reported results confirming that sequential stages of moral development are to be found in different cultures. While the parameters in moral development (rate of development, dispersion of moral maturity scores etc.) were found to vary somewhat from one culture to another, no significant differences between nationalities were found in
account for any significant differences in the development of moral reasoning among Catholics, Protestants, Jews, Buddhists, and Atheists. Academic performance and socio-economic status were found to be highly significant factors affecting development, although the same sequences persisted. Keasey (1973) modified by exposure to various conflict situations, the moral opinions and stage of reasoning of preadolescents at Kohlberg's first three stages of moral development. Opinion and reasoning change were found to be independent processes. The small amount of upward reasoning change induced was consistent with the cognitive-developmental view that radical changes in an individual's stage of cognitive functioning are rare and reaching a more equilibrated state depends on readiness to move upward. Graham (unpub.) in a replication of Kohlberg's measures with British children confirms the importance of chronological age and intelligence in moral development; when intelligence was controlled, social class differences were "rather small" although Classes 1 and 2 "come out on the more 'moral' side". Graham concludes however, that the relations between "moral" variables, intelligence and social class are complex. A curvilinear relationship between moral judgement level and overall frequency of conformity is reported by Saltstein et al. (1972). Stage-3 children (so-called "good boy, good girl, approval-seeking" morality) were more likely to conform than children at either higher or lower moral judgement levels. In particular, very few of the higher level subjects (those at Stages-4 or 5) made any conforming response. Fodor (1969) compared negro and white male adolescents in moral judgement in accordance with the Kohlberg interview. The subjects consisted of twenty-five socially disadvantaged negro boys together with twenty-five white boys aged 14 - 17 years selected at random. The difference between moral judgement scores for white and negro boys was non-significant. There was a statistically significant difference on moral judgement scores between boys whose mothers had graduated from High School and boys whose mothers lacked this experience.

Selman (1971, op. cit. Chapter One) confirmed that the development of reciprocal role-taking skills related to the development of conventional moral judgement among sixty middle-class children at ages 8, 9 and 10. Results of a re-examination one year later of ten subjects whose role-taking and moral judgement levels were low in the original study, supported the hypothesis that the development of the ability to understand the reciprocal nature of interpersonal relations is a necessary but not sufficient condition for the development of conventional moral thought. Noir (1974) concludes that moral development may be characterized in part, as a gradual evolution of role-taking abilities. From correlations between scores of 11 year old girls on Kohlberg's Moral Judgement Interview and a nonmoral-
role-taking test, the results showed that a significant proportion of the variance in moral maturity scores could be accounted for by measures of nonmoral-role-taking. Keeasey (1971) examined the hypothesis that higher stages of moral development would be positively associated with social participation. Extent of social participation was assessed by having subjects indicate the number of social organisations of which they were members or leaders, together with ratings by teachers and peers. The stage of moral development was found to be positively related to the extent of social participation whether judged by self, peers or teachers. Further support was therefore given to Kohlberg's report (Kohlberg passim) that the quality of social participation is associated with accelerated moral development and further, to his proposal that social interaction is an important source of disequilibration which facilitates progression through the stages of moral development together with role-taking opportunities as the fundamental social inputs stimulating moral development.

Keeasey and Keasey (1974 op. cit.) from high correlations and systematic relationships between the stages of cognitive development (concrete and formal operations) and moral development suggest that sophisticated cognitive operations are a prerequisite to advanced moral judgements and further that there is a lag or décalage between the acquisition of logical operations and their application to the area of morality, thereby providing further confirmation for Kohlberg's postulations in this connection. (These postulations have been elaborated in "The Statement of the Problem, Chapter One). Lee (1971) using material based on Kohlberg's work, with children 5 - 17 years, identified, from factor analysis that a concrete operations component best related to a decrease of authority type responses and concomitant increases in moral modes of conceptualization. The formal operations mode of thought best predicted the increase of societal, idealist moral modes of conceptualization. Further support that cognitive and moral modes of thought cohered according to their respective modes of conceptualization was found in the transition function as age progressed. Lee concluded that the findings clearly supported concomitant "growth" of the two modes of thought.

Ego-identity status and "level of moral judgement" were independently assessed and examined in relation to each other by Podd (1972). Subjects who achieved an ego identity were generally characterized by the most mature level of moral judgement, while those with a relative lack of ego identity were generally characterized by either the least mature level of moral judgement or a transitional period between moderate and highly mature moral judgement. People undergoing an identity crisis were found to be unstable and inconsistent in their moral reasoning.
provided support for Kohlberg's characterizations of these levels as externally versus internally oriented. Welshbroth (1970) reports that identification with both parents is significantly related to high moral judgement in males, while identification with the father is significantly related to high moral judgement in females.

Tapp and Kohlberg (1971) derived a theory of legal development from cognitive-developmental theory using kindergarten to college and cross-national preadolescent data. Paralleling evidence on universal moral levels, the development of individual orientations vis-à-vis legal or rule systems revealed consistent movement from a preconventional law-obeying, to a conventional law-maintaining, to a post-conventional law-making perspective. In both the United States and cross-national samples, "law and order" conventional reasoning is modal, reflecting that socialization experiences can accelerate, retard or crystallise the growth of legal values and roles. Tapp (1970) in an earlier report of part of this work, comments that such striking convergences across such divergent nations are "a good sign". The common trends of child development and the socialization goals that transcend nationality suggest that the shared values throughout our world are more compelling than diverse ideologies would imply. (A view counteracting those of Simpson op. cit. who focused on perspectives more aligned with the "cultural relativists") "If these children's wisdom could be maintained into adulthood, there might be a better chance for freedom and justice within a world society, which after all is the message of law". Fontana and Noel (1973) investigated moral reasoning among three role groups: students, "faculty" and "administrators". "Administrators" employed law and order reasoning more than "faculty" and students. "Rightists" used law and order reasoning more than "Leftists" and "Leftists" reasoned egoistically more than "Rightists". Natural scientists employed more law and order and less social contract reasoning than those in the social sciences and humanities. These findings supported the hypothesis that stages of moral reasoning provide a fruitful model for conceptualizing and assessing differences in values and premises among groups and subgroups. A study related to Kohlberg's work and also to Tapp and Kohlberg (1971) by Adelson et al. (1969) traced the growth of the idea of law during adolescence. Depth interviews were conducted with 120 subjects, among whom significant changes in the view of law were found to take place between 13 and 15 years. The level of discourse shifted from concrete to abstract; a restrictive emphasis is replaced by a stress on the positive aims of law and a conception of amendment is increasingly present in the later years, as is an emphasis on the intrapsychic effects of law. In general, law lost its absolutistic meanings and was seen as functional, as a tool for achieving community ends.
Hogan and Dickstein (1970) supported the hypothesis that the ethics of personal conscience (as reflected by the Survey of Ethical Attitudes) is related to a tendency to blame and distrust institutions, while the ethics of social responsibility is associated with a suspicious attitude toward other people. Hogan and Dickstein formulate an "orderly pattern of relationships surrounding these viewpoints": the ethics of conscience, moral institutionism, principled disobedience, doubt concerning the efficacy of the law as a means for promoting human welfare, and a tendency to regard institutions as the source of social injustice seem to be reliably interrelated. The ethics of responsibility, moral rationalism, principled rule compliance, belief in the instrumental value of the law, and a disposition to locate the roots of injustice in the actions of individuals also appear regularly to covary. Hogan and Dickstein comment that it might be argued that the ethics of conscience and responsibility merely reproduce Piaget's stages of autonomous and heteronomous moral judgement or perhaps Kohlberg's later stages. This observation would assume that the ethics of conscience is developmentally more advanced than the ethics of responsibility. However, the authors would disagree on the grounds that the viewpoints in question here are "ideal types" derived from two fundamental traditions in social philosophy. In their pure forms, the ethics of conscience and responsibility should be morally and developmentally equivalent, paralleling for example, the Integratist and Normative conscience orientation. Secondly, the authors have found it useful to conceptualize moral development in terms of four dimensions considered in conjunction with conscience and responsibility (moral knowledge, socialization, empathy and autonomy). According to this view, a proper evaluation of a person's moral posture requires considerable information beyond the manner in which he reasons about moral dilemmas. The moral and developmental implications of a person's position with regard to the ethics of conscience-ethics of responsibility continuum can be properly understood only within the context of total character structure.

H. Kohlberg's Application of His Theory to the Sphere of Moral Education

Kohlberg (1970c) considers that the issue of "real life" brings us to what should be a central concern of moral education, the moral atmosphere of the school. He further elaborates (1971a) that to extend classroom discussions of justice to real life is to deal with issues of justice in the schools. Education for justice, requires making schools more just and encouraging students to take an active role in making the school more just. Kohlberg employs his evidence that children with extensive peer-group participation advance considerably more quickly through the Kohlberg stages of moral judgement than children isolated from such participation, for the application of environmental stimulation in the form of the enhancement of participation and role-taking opportunities. Ultimate
participation is participation in the structure and decisions of the school itself: "Here the principle of participation must be integrated with our principle of stimulation by a justice-structure a stage above the child's own".

Kohlberg (1971a) claims that the existence of moral stages offers the educator an alternative to the arbitrary indoctrination of children with the values he happens to favour. The cognitive-developmental approach to moral development involves the stimulation of natural moral development through the universal stages. The basis of the cognitive-developmental approach is that children have their own way of thinking and consequently, moral education must be based on a knowledge of their stages of development. The following propositions, basic to the cognitive-developmental approach and contrary to the propositions of ethical relativity, Kohlberg claims to be supported by clear research evidence (Kohlberg 1971a op. cit.; Kohlberg and Turiel 1971a):

"(i) We often make different decisions and yet have the same basic moral values. (ii) Our values tend to originate inside ourselves as we process our social experience. (iii) In every culture and subculture of the world, the same basic moral values and the same steps toward moral maturity are found. While social environments directly produce different specific beliefs, (e.g. smoking is wrong; eating pork is wrong;) they do not engender different basic moral principles (e.g. consider the welfare of others; treat other people equally etc.). (iv) Insofar as basic values differ, it is largely because we are at different levels of maturity in thinking about basic moral and social issues and concepts. Exposure to others more mature than ourselves, helps to stimulate maturity in our own value processes. We are, however, selective in our responses to others and do not automatically incorporate the values of elders or authorities important to us".

Kohlberg (1971a and passim) reports that at certain age periods transitions to higher stages are made most easily. The first is the pre-adolescent period (10 - 13 years) when the transition from pre-conventional to conventional thought most commonly occurs. The level of morality at age 10 years does not indicate the level that will be attained in adulthood, but children who do not reach a solid Stage-3 or 4 level by age 13 years are unlikely to attain principled thinking in adulthood. The second transitional period appears to be in late adolescence, ages 15 - 19 years. Results suggest that those who do not use some (at least 20% principled thinking by the end of "High School" are unlikely to develop principled thinking in adulthood.

The school's potential for positive influence on moral development is indicated by a variety of evidence. Bar Yam and Kohlberg (1971 op. cit.) showed the effect of a non-familial environment when disadvantaged adolescents in a Kibbutz High School were compared with a control group of disadvantaged adolescents in the
The Kibbutz adolescents had little direct contact with their parents, yet seemed to show moral maturation. Blatt and Kohlberg (1969 op. cit.) indicated that more restricted educational efforts, such as Sunday School classes, to stimulate moral development can also have a significant effect on children. These studies suggest that by the use of procedures that are little different from those available to any teacher, it is possible to raise children's moral level significantly and in a way that is sustained over time.

The first principle to be embodied by teachers is for the spontaneous moral situations arising in the classroom to be embodied in a programme of moral education, for development is not achieved through direct teaching and instruction. Kohlberg's research evidence indicates that the child generates his own level of thinking and changes gradually. The task of the teacher is to facilitate the process of change. Studies (Rest, Turiel and Kohlberg 1969 op. cit.) suggest that it is not possible to encourage children to comprehend stages much higher than their own, much less to use them spontaneously. Success in stimulating change to a higher stage requires (a) helping children to understand the next highest stage of reasoning and (b) facilitating their acceptance of that reasoning as their own, with the spontaneous use of it in new situations. In another series of studies (Turiel 1966 op. cit.) it was found to be possible to induce change in a child's thinking to the stage directly above his own. Moral reasons below the child's level is not very likely to be education. The teacher's primary task is to help the child to focus on genuine moral conflicts; think about the reasoning he uses in solving such conflicts; see inconsistencies and inadequacies in his way of thinking and find means of resolving such inconsistencies and inadequacies (evidenced by Turiel 1969). Kohlberg and Turiel (1971a) state that these approaches meet the criteria of being constitutional (i.e. they do not qualify as indoctrination, violate no civil rights and are independent of religious doctrines); are philosophically justified (moral philosophers throughout history have in various ways expressed principled moral judgement, moral leaders like Lincoln, Martin Luther King had an ethic based upon an advanced stage of moral development and the stages do not represent middle-class bias - they are universal) and further the approaches are socially useful (persons at a higher level of moral development, not only reason better, but act in accordance with their judgements).

Therefore the aim of moral education is the "stepwise stimulation of development toward a more mature moral judgement and reasoning, which culminate in a clear understanding of universal principles of justice, and not to develop intellectually or morally precocious children by mere acceleration. The aim is to ensure the
CHAPTER FOUR

OUTLINE OF THE INVESTIGATION

A. INTRODUCTION
B. SELECTION OF SCHOOLS
C. MEASURES USED IN THE INVESTIGATION
D. PROCEDURE
OUTLINE OF INVESTIGATION

A. INTRODUCTION

The overall design for investigation involved the administration of Kohlberg’s Moral Judgement Interview to populations contrasted in respect of Piagetian "concrete" and "formal" operativity and precision matched in terms of extraneous variables, namely: IQ, age, sex and socio-economic status.

The final sample consisted of 231 subjects (attrition of the number of subjects by 19, was due to school transfer, inconsistent attendance and incomplete responses), aged 13 years 10 months to 15 years 11 months, ranging in intelligence from below-average minus to intellectually superior (Raven’s categories 1938, 1956); representing socio-economic classes I to IV, in accordance with the Registrar General’s Classification (Registrar General 1960), all attending Secondary Schools in a North London Borough.

B. SELECTION OF SCHOOLS

In selecting the schools it was important that they should be within the same administrative unit, not only for control of environmental factors, but further, because of the current transitional nature and diversification of Secondary Schools organization emanating from the Circular 10/65, issued from the Department of Education and Science and emphasised to varying degrees by successive Governments. A further factor affecting Secondary Schools at the time of the investigation, were preparations for and implementation of the Raising of the School Leaving-Age, which although common to all areas, was being dealt with variably by administrative units in accordance with their individual resources.

1. Selection of the Administrative Unit

Several London Boroughs were approached through the Education Officials, some refusal being received on the grounds of current pressures on Secondary Schools, two offering co-operation. The co-operation offered by the North London Borough was accepted for the following reasons:
(a) The Borough is well-designed and incorporates comprehensive environmental features from semi-rural to urban, historical to modern, with a variety of housing accommodation ranging from the privately owned to council provision.

(b) The population is settled and heterogeneous incorporating various, well-integrated, sub-cultural groups.

(c) The educational administration appeared to be well-organised and consistent throughout the Borough with various forward-looking plans for the future, supported by teams of Educational Advisors and Welfare Officers.

(d) The plans for the Secondary Schools Reorganization on Comprehensive lines appeared to be well-designed in order to cause the least disruption to the schools, least change to the pattern, and to be suited to the resources available - gradually working towards all-through Comprehensive Schools within the next thirty years.

2. **Selection of the Schools**

The final sample of six schools was selected following personal visits and discussion with the Headteachers. It collectively represented pupils from:

- (a) both sexes, both single-sex and mixed schools;
- (b) various social classes;
- (c) various sub-cultural groups and religions;
- (d) various ability groups

Schools included (with sample sizes) were:

- **Local Authority** - girls - one - 49 girls
- **Local Authority** - boys - one - 77 boys
- **Local Authority** - mixed - two - 19 boys 17 girls
  
  12 boys 16 girls
- **Private** - boys - one - 24 boys
- **Private** - girls - one - 17 girls
The schools all followed relatively similar patterns, both in terms of general school organization and in terms of curriculum. All pupils appeared to follow a wide range of subject courses in the early years of secondary school and were only just, at the time of testing, beginning to limit subjects for study in the fourth year. General facilities, sports opportunities, extra-curricular activities and social and community activities appeared similar throughout all schools.

C. MEASURES USED IN THE INVESTIGATION

1. Measures used to equate (match) the various groups


The Standard Progressive Matrices is a test of a person's capacity at the time of the test to apprehend meaningless figures; see the relations between them; conceive the nature of the figure completing each system of relations presented and thereby develop a systematic method of reasoning. Raven describes the scale as "a test of observation and clear thinking" and stresses that by itself it is not a test of general intelligence, although when used in conjunction with the Mill Hill Vocabulary Scales can be considered synonymous with a single test of "general intelligence". The Standard Progressive Matrices Scale is intended to cover the whole range of intellectual development and to be suitable from age eight years to adult level.

Instructions and details of interpretation, including scoring, are to be found in Raven (1960). Further discussion with respect to this measure is included in Chapter Five.

(b) The Mill Hill Vocabulary Scale Form One Senior (Raven 1943)

Like the Matrices Test, the Mill Hill Vocabulary Scale is designed to cover as nearly as possible, the whole range of intellectual development from infancy to maturity. While the Matrices Test provides a reliable index to a person's present capacity for intellectual activity, irrespective of education and language,
the Mill Hill Vocabulary Scale provides a reliable index of the best intellectual level the subject has attained, whatever his present capacity for intellectual activity may happen to be. As stated above, the two tests are designed for use together, in place of a single verbal test of general intelligence, so that it is possible to assess separately and "in a clearly defined form":

(i) a person's present capacity for intellectual work;
(ii) the fund of verbal information he has acquired so far, and thence his cultural level relative to other people;
(iii) the psychological significance of discrepancies between the best cultural level a person has attained, and his present capacity for intellectual activity.

Instructions and details of interpretation, including scoring, are to be found in Raven (1958, 1965). Further discussion with respect to this measure is included in Chapter Five.

(c) Socio-Economic Status

A rating for each subject was obtained based upon parental occupation. The Registrar General's Classification of Occupations (Registrar General 1960) was used as follows:

I Professional and managerial occupations
II Other professional and technical
III (non-manual) Other non-manual occupations
III (manual) Skilled manual
IV Semi-Skilled manual

Social class III in this scale is by far the largest section of the general population and needs distinction between non-manual and manual.

2. Measures used to contrast the various Groups

(a) Measures of Piagetian Operativity - The Piagetian Questionnaire (Tisher, 1962, 1971)

Tisher (1962, 1971) has devised a pencil-and-paper test which can be used to determine a subject's stage of mental development.
Criteria set out in Inhelder and Piaget (1958) were used for the construction of the test which contains 24 multiple-choice items based on four scientific phenomena or tasks: "the bouncing ball," "equilibrium in a balance," "water levels in connected containers" and "shadow of rings." Fourteen of the test items can be classified as "concrete", (that is, they would be most likely solved by pupils in the "concrete" stage of development) and ten as "formal". To correct for guessing only those subjects who correctly answer five or more "formal" items and seven or more "concrete" items are classified as belonging to the formal stage of development. The rationale for the procedure appears in Chapter Five and details of the items and scoring of the items are included in the Appendices.

The administration of the Questionnaire occurs in four phases, corresponding to the four sets of questions. Each phase is initiated with a demonstration of the relevant phenomenon.

Tisher has compared the results obtained using the questionnaire with those obtained using the conversation-interview technique. Further discussion of the validation and use of this instrument is included in Chapter Five. Additions were made to Tisher's original Questionnaire in the form of "why do you think so", to bring it further into line with Piaget's approach. Two counter-suggestion situations were also included.

References to the relevant Piagetian work upon which the Tisher Questionnaire is based are as follows:
<table>
<thead>
<tr>
<th>Designation</th>
<th>Area of Cognitive Strategy</th>
<th>Source</th>
</tr>
</thead>
</table>
| "The Equality of Angles of Incidence and Reflection and the Operations of Reciprocal Implication". | At the concrete stage, subjects establish a correspondence between slope of incidence at path and slope of reflected path. Do not construct law.  
At the formal stage, subjects discover law of equality of angle of incidence and angle of reflection. | "The Growth of Logical Thinking from childhood to Adolescence" Inheldor and Piaget (1958) pp. 3-19 |
| "Equilibrium in the Balance"                     | At the concrete stage, subjects realise that equal weights at equal distance from the fulcrum balance each other and that a smaller weight a great distance from the fulcrum balances with a larger weight closer to the fulcrum on the other side.  
At the formal stage, subjects discover the proportional relationship between weights and distances from the fulcrum. | Inheldor and Piaget (1958) pp. 164-81  |
| "Communicating Vessels"                          | At the concrete stage, subjects discover that water levels return to a common level.  
At the formal stage, the subjects can predict what could happen in one container when the other is raised or lowered. | Inheldor and Piaget (1958) pp. 133-47  |
| "The Projection of Shadows"                      | At the concrete stage, subjects discover that the size of shadow depends on size and distance from the screen.                                                                                                          | Inheldor and Piaget (1958) pp. 199-209 |
Kohlberg has empirically devised an instrument with which to measure moral judgement. Hypothetical moral dilemmas are presented, followed by a series of questions which ask the subject to resolve the dilemma and then probe into the reasons leading the subject to make his decision. It is the reasoning process which is of interest and Kohlberg has delineated criteria by which responses can be scored on a variety of dimensions according to a developmental scale of maturity of moral judgement. The moral judgement test has been designed so that it can be used either in written form or as a structural interview. The Moral Judgement Scoring Guide is a lengthy document and condensed extracts are therefore included in the Appendices. Further discussion of the scoring is included in Chapter Five.

The selection of situations from Kohlberg's (1971b) Moral Judgement Interview was as follows:

**Moral Form A**

<table>
<thead>
<tr>
<th>Story</th>
<th>Conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>iii</td>
<td>Heinz steals the drug</td>
</tr>
<tr>
<td>iv</td>
<td>The wife wants euthanasia</td>
</tr>
</tbody>
</table>

**Moral Form B**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Conflict</th>
</tr>
</thead>
<tbody>
<tr>
<td>v</td>
<td>The captain orders a man to his death</td>
<td>Authority and Justice</td>
</tr>
<tr>
<td>vi</td>
<td>Choose the sick man or the troublemaker</td>
<td>Justice</td>
</tr>
<tr>
<td>vii</td>
<td>One brother steals, the other &quot;cons&quot;</td>
<td>Law vs. Justice</td>
</tr>
<tr>
<td>viii</td>
<td>The reformed criminal hasn't served his jail term</td>
<td>Law vs. Justice</td>
</tr>
</tbody>
</table>
PROCEDURE

Subjects were tested from three schools during 1973 and from the remaining three during 1974. Testing took place between the months of March and June in 1973 and April and May in 1974. Testing was completed within each school during a period not longer than four weeks. In all schools testing was arranged in accordance with the school timetable, two units of time-table being allotted for each testing session; this amounted to four sessions of one hour and twenty minutes each, in total, thereby allowing for the establishment of rapport, explanation and demonstration.

The order of administration of tests was kept throughout, as follows:

Session 1  (The Standard Progressive Matrices, Sets A, B, C, D and E
(The Mill Hill Vocabulary Scale
Session 2  (Moral Judgement Dilemmas III and IV
(Moral Judgement Dilemma VII
Session 3  (The Piagetian Questionnaire
Session 4  (Moral Judgement Dilemmas V and VI
(Moral Judgement Dilemma VIII

Situations VII and VIII were considered the most suitable dilemmas to divide between two sessions. Unlike the other two-situation units, they consist of two separate stories, not a continuation, and are relatively short.

Background Information

Additional information obtained included:

Date of birth;
Position in the family - ages of brothers and sisters;
Out-of-school-activities and interests;
Ambitions for career
CHAPTER FIVE

MEASUREMENT OF THE VARIABLES

A. Measures used to Equate (match) the Various Groups

1. Age
2. Sex
3. Socio-Economic Status
4. (a) Intelligence
   (b) Vocabulary

B. Measures used to Contrast the Various Groups

1. Measures of Piagetian Operativity
2. Measures of Moral Judgement
CHAPTER FIVE
MEASUREMENT OF THE VARIABLES

A. MEASURES USED TO EQUATE (MATCH) THE VARIOUS GROUPS

1. Age

Subjects were engaged in the fourth year of the Secondary School Curriculum, therefore within the approximate CA range, 14 years to 15 years.

2. Sex

Subjects representing both sexes were included.

3. Socio-economic status

Subjects representing socio-economic classes I to IV in accordance with the Registrar General's Classification (Registrar General 1960) were included. (Further details have been given in the previous Chapter - "Outline of the Investigation" - Chapter Four).

4. (a) Intelligence: Standard Progressive Matrices


The Standard Progressive Matrices, Sets A, B, C, D and E in accordance with Raven (1960) together form "a test of a person's capacity at the time of the test to apprehend meaningless figures presented for his observation, see the relations between them, conceive the nature of the figure completing each system of relations presented, and, by so doing, develop a systematic method of reasoning".

The scale comprises 60 untimed, multiple-choice problems, each consisting of a design or "matrix" from which a part has been removed, divided into five sets of 12. In each set the first problem is as nearly as possible self-evident, with the problems following, becoming progressively more difficult. The order of the tests provides the standard training in the method of working and five progressive assessments of a person's capacity for intellectual activity. The themes employed are (a) continuous patterns, (b) analogies between pairs of figures, (c) progressive alterations of patterns, (d) permutations of figures and (e) resolution of figures into constituent parts. The Scale is intended to cover the whole range of intellectual
development and can be given either as an individual, a self-administered or as a group test to provide an index of intellectual capacity, irrespective of nationality or education.* The contribution which each of the five sets makes to the total provides a means of assessing the consistency of the estimate and the psychological significance of discrepancies in the test results.

Raven (op. cit.) claims that the test measures what he variously calls "innate eductive ability", "eductive intelligence" or simply "eduction" and stresses that by itself, the scale is not a test of "general intelligence" and that the emphasis needs to be on a test of observation and clear-thinking. Each problem in the scale is a "source" of a system of thought - hence the name Progressive Matrices. However, the Progressive Matrices are recommended by Raven to be used together with the Mill Hill Vocabulary Scales in place of a single test of general intelligence. The Progressive Matrices Scale has a re-test reliability varying with age, from 0.83 to 0.93; correlates 0.86 with the Terman-Merrill scale, being found to have a "g" saturation of 0.82. Raven on the basis of the evidence for the changing ratio between age and test scores on Progressive Matrices especially before age 14, has been opposed to converting Progressive Matrices scores into IQ's. He has preferred the use of percentile ranks thereby evaluating ability in terms of the percentage frequency with which a similar degree of ability is found to occur amongst people of the same age.

(i) Scoring

The standard record form is arranged so that it can be marked by superimposing a stencil marking key. A person's score on the scale is the total number of problems he solves correctly when he is allowed to work through the series from beginning to end, and is classified as follows:

* Raven adds the proviso that the scale appears, from published correlations, to justify this claim, although conclusions can never be accepted uncritically.
<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Percentile Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Intellectually Superior</td>
<td>Score above 95th percentile for age</td>
</tr>
<tr>
<td>II</td>
<td>Above Average</td>
<td>Score at or above the 75th percentile</td>
</tr>
<tr>
<td>II+</td>
<td></td>
<td>Score at or above the 90th percentile</td>
</tr>
<tr>
<td>III</td>
<td>Average</td>
<td>Score lies between 25th and 75th percentile</td>
</tr>
<tr>
<td>III+</td>
<td></td>
<td>Score greater than median or 50th percentile</td>
</tr>
<tr>
<td>III-</td>
<td></td>
<td>Score less than median</td>
</tr>
<tr>
<td>IV</td>
<td>Below Average</td>
<td>Score lies at or below 25th percentile</td>
</tr>
<tr>
<td>IV-</td>
<td></td>
<td>Score lies at or below 10th percentile</td>
</tr>
<tr>
<td>V</td>
<td>Intellectually defective</td>
<td>Score lies at or below 5th percentile</td>
</tr>
</tbody>
</table>

(ii) **Validity and Reliability**

Shipley (1949), Orme (1966), Cronbach (1961) and Irvine (1969) support the Progressive Matrices test with respect to its highly abstract content and its more direct relation to "native" intelligence, with less to academic achievement, educational opportunity or cultural background. Orme focuses on the frequency, from statistical analyses, with which the Progressive Matrices has proved to be a most reliable non-verbal measure of the general factor involved in intelligence. Irvine draws attention to its culture-free potential and its prominence as an experimental cross-cultural test.

Burke (1958) in a critical review of the literature relating to the Progressive Matrices, with respect to content validity states that no studies report correlations of Progressive Matrices with other tests of mental ability as high as that given by Raven's .86 with the Terman-Merrill. The combination of verbal and performance scores on the Wechsler tests gave the next highest correlations with
Progressive Matrices e.g. .75 (Barrett 1956) and .74 (Klonoff 1951). Burke focuses on the confirmatory evidence for the validity of the Progressive Matrices in the sense of capacity to differentiate among age groups below 15, which has been furnished in graphs and tables provided in Raven's (1941, 1956) standardisation data and citing a number of studies concludes that "there is abundant evidence of concurrent validity for Progressive Matrices in the sense of its capacity to discriminate over a wide range among groups known by other criteria to differ in intellectual capacity". He considers that it is not a substitute in any sense for the Binet or Wechsler tests, nor for any verbal or non-verbal group test of mental ability, but is perhaps an almost equally useful supplement and shows inter-correlations with such tests perhaps as high as they show with one another. (However, Burke, 1972, later reports that data on reliability for ages above 25 years compare favourably with similar data for the reliability of WAIS verbal and performance scores.)

Burke (1958) cites Spearman as having "set English opinion in regarding progressive Matrices as a nonverbal test of "g", 'the best of all' to quote Vernon and Parry (1949) .........' an almost pure "g" test." Burke summarises from the researches cited, that the evidence is not convincing that Progressive Matrices has validity as a pure measure of the Spearman construct of "g"; and doubt may be raised whether such a construct can be measured independently of the modality through which it is expressed, the selectivity of the subjects and their sex, and possibly the presuppositions of the factor analyst. He cites Ackina and Lyerly (1952) who reported from their comprehensive factor analysis no evidence for a "general reasoning" factor, nor "any factor fully corroborating Spearman's "g" among their first order factors." However, they identified factors relating to hypothesis verification (sometimes referred to as inductive ability), perceptual speed and concept formation. Burke and Bingham (1969) reporting that Progressive Matrices loaded on a verbal factor speculate that the test could depend on verbal ability in the sense that the subjects "talk their way through, i.e., they explain to themselves verbally what the relationships are.
Jensen (1970) comments that the intercorrelations among tests are roughly related to their degree of proximity on the complexity continuum and tests which are intended to identify "g", such as Raven's Progressive Matrices, show increasing correlations with other tests as one moves along the continuum from simple to complex. Jensen (1973) cites the study of MacArthur and Elley (1963) involving setting up certain desirable criteria for culture-reduced tests and studying a large number of such tests along with conventional IQ tests. Raven's Progressive Matrices and Cattell's Culture-Fair Tests of "g" proved to be superior, showing negligible loadings on verbal and numerical factors; less significant relationships with socio-economic status than conventional tests. Westby (1953), with some reservations, gives further support to Progressive Matrices as a test avoiding effects of previous learning.

MacFarlane Smith (1964) with respect to spatial factors within the Progressive Matrices states that it is not a true K-test, because it does not involve the perception of organised configurations in a way which is critical for successful performance. It involves explicit trial and error and the checking and cross-checking of relationships between the different parts of the figures. From a factor-analysis, Progressive Matrices was found to have spatial loadings on Sets A, C and E of .17 and Sets B and D, a zero loading. Keir (1949) and Vernon (1950) also found small spatial loadings on Sets A, C, and E and Keir suggested that this was due to these sets comprising the section of the Matrices test most readily worked by attention to the figure as a whole.

Approaches to Testing in the Present Investigation

The Standard Progressive Matrices, Sets A, B, C, D and E were administered as a group test following the instructions and procedure set out in Raven 1960 (pp.8 - 9). Marking, scoring and grading also followed the recommended system (pp.10 - 15). Extracts from the Standard Progressive Matrices are included in the Appendices.

4. (b) Vocabulary: The Mill Hill Vocabulary Scale with the Progressive Matrices Scale (Raven 1943)

Like the Matrices Test, the Mill Hill Vocabulary Scale is designed to cover as nearly as possible the whole range of intellectual
development from infancy to maturity and to be equally useful with subjects of every intellectual level. While the Matrices Test provides a reliable index to a person's present capacity for intellectual activity whatever language he speaks or education he has acquired, the Mill Hill Vocabulary Scale provides an index of a subject's present recall of acquired information and ability for verbal communication. Raven (1950) claims, that demands on a person's present capacity for intellectual activity and rational judgement are reduced to a minimum. The fact that the Scale provides a consistent and reliable estimate of a person's recall of verbal information at the time of the test explains both its uses and limitations: to this extent it shows a person's present cultural level relative to other people, which is not necessarily the best level he has ever reached, or may in future achieve. It indicates with some accuracy a person's present ability to express his ideas orally or in writing and even his ability to read and spell, thereby indicating a person's educational attainments. The information it provides is explicit and valuable, but before any inferences can be drawn concerning progress in the future or causes of failure in the past, it is necessary to know in addition, the present capacity for intellectual activity and rational judgement. Raven suggests that when the Vocabulary Test is used along with the Matrices Test, inferences concerning past limitations or deterioration must inevitably remain at the level of speculation but inferences concerning future progress can however be verified by subsequent observation and Raven claims that over a period of time, predictions made on the basis of these two tests have proved more correct than cross-sectional studies alone might suggest. By using two separate tests in place of a simple test of general intelligence a clear distinction can be made between a person's capacity for rational judgement and his present ability to recall verbal information. The Standard Scale consists of 88 suitably selected words, arranged in order according to the frequency with which they are usually known. It is divided into two exactly parallel series of 44 words, known as Set A and Set B. Children and adults able to read and write down the meaning of each word in Set A and for each word in Set B to select a synonym from a group of six words provided. This is known
as Form One. Form two, for the purpose of re-testing consists of defining each word in Set B and selecting a synonym for each word in Set A. For those over the age of 14 years, Form One Senior and Form Two Senior, the ten easiest words in each set are omitted and the eleventh is printed as a worked example.

**Scoring**

For most purposes it is only necessary to ascertain the total number of words in the scale a person can explain, although the test also allows for qualitative analyses.

Scores are classified as:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Verbally superior</td>
<td>Score lies at or above the 95th percentile for age</td>
</tr>
<tr>
<td>II</td>
<td>Above average</td>
<td>Score lies at or above the 75th percentile</td>
</tr>
<tr>
<td>II+</td>
<td></td>
<td>Score lies at or above the 90th percentile</td>
</tr>
<tr>
<td>III</td>
<td>Average</td>
<td>Score lies between 25th and 75th percentile</td>
</tr>
<tr>
<td>III+</td>
<td></td>
<td>Score is greater than the median or 50th percentile</td>
</tr>
<tr>
<td>III-</td>
<td></td>
<td>Score is less than median</td>
</tr>
<tr>
<td>IV</td>
<td>Below average</td>
<td>Score lies at or below the 25th percentile</td>
</tr>
<tr>
<td>IV-</td>
<td></td>
<td>Score lies at or below the 10th percentile</td>
</tr>
<tr>
<td>V</td>
<td>Verbally defective</td>
<td>Score lies at or below the 5th percentile</td>
</tr>
</tbody>
</table>

The percentile grades for children and adults up to the age of 85 years are given in Raven (1958, 1965).

**Standardization**

Standardization procedures are given in Raven (1958). The overall correlation between Set A and Set B words was found to be "in the neighbourhood of 0.90". Raven reports that the Vocabulary
Test may be expected to give the highest re-test reliability and
to correlate most closely with the Matrices Test for those between
12 - 50 years.

Wechsler (1949) states that in spite of the excellent criteria
and statistical procedures used, the net result, as in the case of
other vocabulary tests, is to furnish median scores which discriminate
only modestly between successive age levels. Thus the difference
between successive median age scores (4½-14) is on the average only
about two words. On the other hand, the author's norms show a very
marked jump from the median 14 year score to that of the average
adult. The difference between these two age levels is much greater
than those found by American Authors (Terman and Wechsler). On the
Mill Hill List (68 words), the jump is from 30 to 55; on the Terman
List (45 words) from 16 to 20; on the Wechsler list (42 words) from
20 to 25. Wechsler considers that the claim that the Mill Hill
Vocabulary Test was designed to complement the Progressive Matrices,
both scales constructed to cover as nearly as possible the whole range
of intellectual development from infancy to maturity is an
unsupported claim and "would be difficult to prove". However, Wechsler
considers that the Mill Hill is nevertheless an excellent test
measuring in "a rather good way the same factors which may be said
to be measured by other vocabulary tests".

Bortner (1965) focuses on the difficulty of interpreting the
portion of the test requiring the testee to write his answers, for
poor spelling ability may lead him to use inappropriate substitute
words or his general expressive ability may lead him to use
inappropriate substitute words or his general expressive ability
may lead him to use inappropriate substitute words or his general
expressive ability may be systematically inferior to his actual
comprehension as indicated by an oral test. These considerations
Bortner feels suggest that the test is measuring more than merely
the "acquired information" the author seeks in order to supplement
his Progressive Matrices. Further, the suggestion that the test
be used together with the Standard Progressive Matrices helps to
counterbalance the latter's excessively perceptual approach to
the measurement of intelligence but, it does not go far enough, since it still leaves unmeasured, the variety of measurable abilities commonly subsumed under the matrix of intelligence.

Approaches to Testing in the Present Investigation

Form One Senior of the Mill Hill Vocabulary Scale was administered as a written group test following the instructions set out in Raven (1956, p.36; 1965, pp.3-4). Marking, scoring and grading also followed the recommended system (Raven 1950, pp.31-33, 52-62; 1965, pp. 4-10).

B. MEASURES USED TO CONTRAST THE VARIOUS GROUPS

1. Measures of Piagetian Operativity - The Piagetian Questionnaire

Piaget, sets up a theoretical framework to account for the development of intelligence from childhood to adolescence (Inhelder and Piaget, 1956) and outlines in detail the mental operations of which children at various age levels are capable.

Piaget has shown that the preoperational child makes judgments that are fragmentary, inconsistent and in terms of a single relationship at a time; not being capable of reversible operations. As the child enters the concrete stage of mental development, his judgments (i.e. operations) gradually become reversible and co-ordinated, but are limited to tangible and visible materials and objects. He is able to classify material; break down groups into constituent parts; place a series in order; pair corresponding elements and substitute equivalent elements; but when solving problems a trial and error approach is adopted, no hypotheses are proposed and tested, nor are all available possibilities tested. When the formal stage of development has been achieved, the adolescent is capable of setting-up and testing theories against available data. Propositions are dealt with as opposed to concrete objects and relations between the symbols which
are being dealt with can be held in the mind and the relations can be transformed in various ways. Problem-solving involves a systematic approach; constructions and testing for implication, non-implication and incompatibility are involved.

By devising various ingenious experiments, Piaget was able to determine the operations of which a child at a given age was capable and to confirm the existence of periods of equilibrium and acceleration in mental development. However, Tisher (1962) emphasises that Piaget's "clinical" or "conversation-interview" method has been criticised, in particular, for his failure to use statistical techniques and to standardize the method of testing (Hazlitt 1930; Suchman and Aschner 1961; Braine 1962; Flavell 1963; Wallace 1972). Tisher (op. cit.) proposes therefore that the clinical method, as used by Piaget, thus becomes suspect and perhaps should be jettisoned in favour of another technique for collecting data. However, when the clinical method is jettisoned, the study becomes vulnerable to the type of criticism levelled by Moore (1950), who commented that in much of the research purporting to test Piaget's theories, the investigators failed to use Piaget's methods and as a consequence, these studies cannot be considered to be replications of Piaget's work nor to adequately test his theories. Despite criticisms of the type levelled by Moore, several researchers (Keets 1955; King 1961; Teneke, Campbell and Helmick 1970; Peel 1971; Bart 1972; Dulit 1972; Shayer and Wharry 1974; Winkelmann 1974, 1975) have used the questionnaire technique to collect data in studies purporting to test Piaget's theories. The questionnaire method has several advantages: it readily allows quantification of responses and large numbers of pupils may be examined in a relatively shorter time than when the same number are to be interviewed. Towards resolving doubt as to whether studies using techniques other than the techniques used by Piaget can be considered adequately to test his theories, Tisher prepared a questionnaire and compared the results obtained with those obtained from standardized conversation-interviews.

Therefore Tisher (1962, 1971) reports a step in the development, validation and use of a Piagetian questionnaire with secondary school pupils with respect to concrete and formal operational thinking. The objectives were: to develop a simple pencil-and-paper test which could be used to determine a pupil's stage of mental development; to use the test to survey the distribution of stages in a group of secondary school students; and to compare the results obtained using the questionnaire with those obtained using the conversation-interview technique.
(i) Methodology

A group of 232 pupils, 138 males and 94 females, formed the experimental sample, representative of pupils in Australian grades, seven through nine, the distribution of ages being as follows:

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.0 - 12.4</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>12.5 - 12.9</td>
<td>17</td>
<td>17</td>
<td>34</td>
</tr>
<tr>
<td>13.0 - 13.4</td>
<td>23</td>
<td>17</td>
<td>40</td>
</tr>
<tr>
<td>13.5 - 13.9</td>
<td>27</td>
<td>16</td>
<td>43</td>
</tr>
<tr>
<td>14.0 - 14.4</td>
<td>18</td>
<td>16</td>
<td>34</td>
</tr>
<tr>
<td>14.5 - 14.9</td>
<td>25</td>
<td>8</td>
<td>33</td>
</tr>
<tr>
<td>15.0 - 15.4</td>
<td>13</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td>15.5 - 15.9</td>
<td>9</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>16.0 - 16.4</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16.5 - 16.9</td>
<td>1</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>138</td>
<td>94</td>
<td>232</td>
</tr>
</tbody>
</table>

IQ ranges were from 71 - 135, mean IQ 102.8, standard deviation 12.9 on the basis of ACER Junior B tests. Pupils were placed in one of three cultural enrichment groupings based on the occupations of parents and the investigators assessments of the pupils and their home environments.

The Piagetian questionnaire (described in greater detail later) was administered to the experimental sample during two consecutive 40-minute teaching periods and was divided into four phases coinciding with four sets of questions, each phase being initiated with a demonstration of the relevant phenomenon.

Fifty-seven pupils, 19 in each grade, were randomly selected from the experimental sample and were involved in a "conversation-interview" situation following the approaches of Inhelder and Piaget (1958). The tape-recordings of the interviews
were transcribed and all transcripts were analysed using the criteria established by Inhelder and Piaget to classify pupils as either "formal" or "concrete".

(ii) The Questionnaire

The pencil-and-paper questionnaire contains 24 multiple-choice items based on four scientific phenomena, or tasks used by Inhelder and Piaget (op. cit.), namely: "the bouncing ball"; "equilibrium in a balance"; "water levels in connected containers"; and "shadows of rings". The concepts needed to explain these phenomena are respectively: the angle of incidence equals the angle of reflection; the sum of the clockwise moments equals the sum of the anti-clockwise moments; the horizontal water level in each container is the same; and the size of the shadow is proportional to the size of the ring and the distance of the ring from the light source. The questions based on the aforementioned are shown in the complete Questionnaire reproduced in the Appendices. Diagrams of the apparatus used for the demonstrations are included in the Questionnaire as shown. The form of the Questionnaire was of the objective type and was chosen for its relative ease of administration and scoring.

Inhelder and Piaget's investigations (Inhelder and Piaget 1958) indicated that when subjects experimented for example, with two communicating vessels containing water, they found that at the concrete stage, the subjects discovered that water levels in both containers returned to a common horizontal level after one or both of the containers were raised and lowered. At the formal stage, the subjects could give a correct explanation for the observed equality of the levels and could predict what would happen to the water level in one of the containers if one or the other container were raised or lowered. Similarly, Inhelder and Piaget found that subjects experimenting with a balance arm (ibid, pp. 164-181) did not discover the principle of moments until the formal stage of mental development. At the concrete stage, the subjects realised that equal weights at equal distances from the fulcrum balanced each other and that a smaller weight, a greater distance from the fulcrum on the left-hand side balanced a larger weight closer to the fulcrum on the right-hand side. The subjects did not discover the proportional relationship between weights and distances, characteristic of the formal stage. These findings were taken as criteria to set the concrete and formal type problems in Sets Three and Two respectively of the Questionnaire. To illustrate how the criteria apply to these problems, two of the questions in Set Two are discussed.
A ten pound weight is hung at C. To balance the arm again with another ten pound weight,

(a) the weight must be hung at H.
(b) is impossible
(c) the weight must be hung at E.
(d) the weight must be hung at J.
(e) the weight must be hung at I.
(f) the weight must be hung at K.

This question could be solved by a subject in the concrete stage of mental development since a subject in this stage would realise that equal distances from the fulcrum balance each other.

A ten pound weight is hung at C. To balance the arm again using a fifteen pound weight,

(a) the weight must be hung at K.
(b) the weight must be hung at I.
(c) the weight must be hung at G.
(d) is impossible
(e) the weight must be hung at E.
(f) the weight must be hung at H.

This question could be solved only by a subject in the formal stage of mental development since the question requires that the subject has discovered the proportional relationship between the weights and their distances from the fulcrum.

The criteria used to design the questions in Sets 1 and 4 are summarised as follows:
<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>Concrete Stage</th>
<th>Formal Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bouncing Ball</td>
<td>Subjects can establish a correspondence between slope of incidence at path and slope of reflected path. Do not construct law: angle of incidence = angle of reflection</td>
<td>Subjects discover law of equality of angle of incidence and angle of reflection</td>
</tr>
<tr>
<td>Formation of Shadows</td>
<td>Discover that size of shadow depends on size and distance of object from screen; no inverse metrical relationship between size and distance discovered</td>
<td>Discover inverse metrical relationship between the size of the object and its distance from the screen</td>
</tr>
</tbody>
</table>

(iii) **Demonstration**

Before each set of questions was attempted, the investigator performed a demonstration as follows:

"The Bouncing Ball": A tennis ball was bounced on the front wall of the room and the subjects asked to observe what happened. Several angles of incidence were used.

"Moments or Equilibrium in the Balance": A metre rule pivoted at its centre of gravity was displayed and a 0.4 pound weight placed 5cms. from the fulcrum on the left hand arm. Equilibrium was restored by placing firstly, a 0.2 pound weight 10cms. from the fulcrum on the right hand side and secondly a 0.5 pound weight 4cms. from the fulcrum on the right hand side. Weights and distances were mentioned and the subjects asked to observe carefully as the demonstration was performed.

"Water Levels": Two connected water containers were moved, one at a time, and the pupils asked to observe what happened. A horizontal metre rule held behind the containers marked the position of the original water level above the table.

"Formation of Shadows": Three rings of different diameters were placed at different distances from a source of light and their shadows allowed to fall on to a screen. The pupils observed the shadows as the distance of each object from the light was varied. The demonstrator commented: "watch what happens as I move these objects backwards and forwards".
(iv) The Interviews

The three experiments chosen for the interview were based on those used by Inhelder and Piaget (1958) and included "Invisible Magnetism" (pp. 93-106), "Combinations of Chemicals" (pp. 107-122) and "Equilibrium in the Balance" (pp. 164-181).

"Invisible Magnetism": The problem was to determine why a metal bar attached to a non-metallic rotating disc stopped with the bar pointing to one pair of marked boxes instead of three other pairs of marked boxes placed around the circumference of the disc. The crucial pair contained alnico bar magnets. Inhelder and Piaget used this problem to show how children in the formal stage of mental development utilize disjunctions and exclusions to solve the problem. The large board divided into pairs of sectors, each pair with a different colour, could be removed to allow pupils to inspect the ball-bearing pivot and axle on which the black bar rotated. The marked, covered boxes were filled with materials of different densities. When the bar is rotated it spins but with decreasing angular acceleration due to the effect of the magnets. Theoretically, there are two equilibrium positions, one with the bar pointing to the magnets and the other, with the bar in a position at right angles to the line joining the magnets. It can be shown that the most likely position to be taken up by the decelerating rotating bar is the former, but there will be a few occasions where it takes up the latter. This introduces an additional factor to be excluded in order to solve the problem. Piaget does not comment upon this factor.

"Combination of Chemicals": Four identical reagent bottles, numbered 1 to 4, contained dilute sulphuric acid, distilled water, distilled water with hydrogen peroxide and a solution of sodium thiosulphate, respectively. A fifth smaller bottle, labelled "g" complete with eye dropper contained a solution of potassium iodide. The problem was to determine the combination of reagents that would liberate iodine and hence produce a yellow colour. All solutions were odourless and colourless. The combination 1 and 3 and g gave the required colour. Inhelder and Piaget used this problem to investigate children's ability to construct two-by-two, three-by-three etc. combinations and to determine whether this ability occurred prior to 11-12 years.

"Equilibrium in the Balance": The purpose of this experiment was to investigate subjects' notion of proportions and the emergence of what Piaget calls INRC group of operations (ibid. p. 175). A metre rule was pivoted at its centre of gravity and numerous weights, each of 0.1 pound, could be hung at any position on the right hand or left hand side of the arm. The problem was to return the balance
arm to a state of equilibrium after the examiner had upset the equilibrium by placing one or two weights on the left hand side of the arm.

(v) Analysis of the Results

Classification of Subjects: Tisher with respect to the obvious challenge concerning guessing in a multiple-choice situation, elaborates that in the case of a subject presented with 10 formal test items, each containing five choices, the chance of correctly guessing the answer in one item, independently of the other items, is one fifth or 0.2. The probability of him correctly guessing \( i \) answers from the 10 items is \( p_i \), where,

\[
p_i = \binom{n}{i} \cdot p^i \cdot (1-p)^{n-i}
\]

(c.f. Dixon and Massey, 1957, pp 356-40)

and where \( p = 0.2 \) = the probability of correctly guessing the answer in one item.

If the probability of correctly guessing \( x \) or less answers from the 10 items is \( p_x \) then,

\[
p_x = \sum_{i=0}^{\min(x,10)} p_i
\]

For the 10 formal items of 5 choices each,

\[
p_5 = 0.98; \quad p_4 = 0.96; \quad p_3 = 0.87; \quad p_2 = 0.63; \quad p_1 = 0.39
\]

and for 14 concrete items of 5 choices each

\[
p_5 = 0.92; \quad p_4 = 0.84; \quad p_3 = 0.67; \quad p_2 = 0.41
\]

Thus the probability of a subject correctly guessing 5 or more answers from the groups of 10 formal or 14 concrete items, each containing 5 choices, is extremely small. If the subject is in the formal stage of mental development it is to be expected that he will do better than by guessing on both the formal and the concrete items. On the average the items in the questionnaire contain five alternatives and hence the values quoted above may be taken to represent the order of magnitudes of the \( p_x \)'s. It was assumed that subjects scoring 5 or more on the formal items and subjects scoring 7 or more on the concrete items were doing better than by guessing and these two scores were taken as criterion levels for classifying subjects.

Inhelder and Piaget (op. cit.) distinguished between subjects in the early and late phases of the concrete stage and formal stage of mental development. A similar distinction was initially made in Tisher's study. A score of 7+ on the
concrete items and 5+ on the formal items was taken to indicate that the subject was in the formal stage of mental development, while a score of 11+ on the concrete items and 8+ on the formal items was taken to indicate a superior achievement. In the latter case the subject was assumed to be in the later phase of the formal stage. Similarly, a score of 7+ on the concrete items and 4 or less on the formal, were taken to indicate the subject was in the concrete stage of mental development. A score below 7 on the concrete items and below 4 on the formal items were taken to indicate the subject was in the early phase of the concrete stage.

**Criterion Scores for the Classification of Subjects into Stages of Mental Development**

<table>
<thead>
<tr>
<th>Score on Concrete Items</th>
<th>Subjects classified into</th>
<th>Score on Formal Items</th>
<th>Subjects classified into</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early Concrete</td>
<td>Later Concrete</td>
<td>Early Formal</td>
</tr>
<tr>
<td>0 - 6</td>
<td></td>
<td>7 - 14</td>
<td>7 - 14</td>
</tr>
<tr>
<td>0 - 3</td>
<td></td>
<td>0 - 4</td>
<td>5 - 10</td>
</tr>
</tbody>
</table>

Tisher reports that it is of interest to note that all subjects scoring 5+ on the formal items scored 7+ on the concrete items. The table below shows the distribution of formal versus total scores for all subjects classified into the formal stage of mental development. The data in the table presents additional evidence for the validation of the questionnaire.

**Number of Subjects in the Formal Stage gaining certain Formal and Total Scores: Minimum total score obtained 13**

<table>
<thead>
<tr>
<th>Total Score</th>
<th>Formal Score 5 - 6</th>
<th>7 - 6</th>
<th>9 - 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 - 14</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 - 19</td>
<td>30</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>20 - 24</td>
<td>7</td>
<td>19</td>
<td>7</td>
</tr>
</tbody>
</table>
Distribution of Pupils in Concrete and Formal Stages

The following tables show the distribution of pupils in the concrete and formal stages with age and school grade (the numbers in parenthesis refer to the number of females in each category).

<table>
<thead>
<tr>
<th>Stage of Development</th>
<th>Age (in Years)</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12.0 to 13.4</td>
<td>13.5 to 14.9</td>
</tr>
<tr>
<td>Concrete</td>
<td>74 (37)</td>
<td>71 (25)</td>
</tr>
<tr>
<td>Formal</td>
<td>7 (1)</td>
<td>41 (14)</td>
</tr>
<tr>
<td></td>
<td>81 (38)</td>
<td>112 (39)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage of Development</th>
<th>Grades</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VII</td>
<td>VIII</td>
</tr>
<tr>
<td>Concrete</td>
<td>112 (50)</td>
<td>30 (10)</td>
</tr>
<tr>
<td>Formal</td>
<td>7 (1)</td>
<td>17 (7)</td>
</tr>
<tr>
<td></td>
<td>119 (51)</td>
<td>47 (17)</td>
</tr>
</tbody>
</table>

The chi-square test was applied to various groups of cells in the rows and columns and a number of the significant (5% level) findings are reported below. When chi-square values were calculated it was found that there were no significant differences between the number of males and females in each of the stages. In subsequent analyses males and females were combined. For the distribution of pupils by age, it was found that there was a significant difference between the number of pupils in the concrete and formal stages for the 12.0 - 13.4 age group (chi-square = 56.9, df = 1, p < 0.005) and the 13.5 - 14.9 age group (chi-square = 8.1, df = 1, p < 0.005). Also when a chi-square was calculated for
In columns 1 and 2, there was a significant difference between the numbers of pupils in the cells of the 12.0 - 13.4 and 13.5 - 14.9 age group (chi-square = 19.3, df = 1, p < 0.005). The data were interpreted as indicating that for the 12.0 - 13.4 and 13.5 - 14.9 age groups, although a significant majority were in the concrete stage, there was a marked increase in the proportion of pupils in the formal stage at age 13.5 - 14.9. In the latter group there was a significantly greater proportion of pupils in the formal stage than in the former age group (37% compared to 9%). In each group there was a significantly greater proportion of pupils in the concrete stage compared to the formal stage. Beyond 13.5 - 14.9 years there was no significant variation between the numbers of pupils in the concrete and formal stages and there was no significant difference between the 13.5 to 14.9 and 15.0 - 16.4 year old groups. There was no evidence to suggest that the majority of Secondary school pupils aged 13 plus would be in the formal stage of mental development. On the contrary, a large proportion, 61% of this age were in the concrete stage. This refutes Piaget's implications that at about 13 years, the majority of adolescents will be in the formal stage of mental development. The results further showed that a sharp age boundary between "a significant majority of pupils in the concrete stage" and a "significant majority of pupils in the formal stage" does not exist. There appeared to be an age zone during which adolescents enter the formal stage rather than a sharp age-line boundary. At each age level pupils in either stages of development were found. (This is in agreement with many of the studies cited in Chapter Two). Tisher concludes that while it appears to be a fallacy to speak in terms of an average age for the emergence of a stage it does seem that the order of succession of the stages is important. Tisher additionally reports that when the responses of the pupils in the formal stage of mental development were considered, it emerged that when the average formal score expressed as a percentage is recorded against CA with increasing age there is a levelling out of this average score. This adds support to Piaget's view that there is an equilibrium or levelling out phase in the formal stage of mental development - a period of genesis followed by a period of equilibrium.

### Average Score on Formal Questions for Pupils in the Formal Stage of Development

<table>
<thead>
<tr>
<th>Age in Years</th>
<th>12.0-13.4</th>
<th>13.5-14.9</th>
<th>15.0-16.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Formal Score</td>
<td>53%</td>
<td>64%</td>
<td>66%</td>
</tr>
</tbody>
</table>
With respect to cultural enrichment group, Tisher reports a significant proportion of pupils in cultural enrichment group 3 were in the concrete stage of mental development and that there was a significant difference between the number of pupils in the concrete and formal stages in groups 1 and 3.

For the distribution of pupils by grade, it was found that there was a significant difference between the number of individuals in the concrete and formal stages for grade VII (chi-square = 4.9, df = 1, p < 0.005) and grade IX (chi-square = 4.9, df = 1, p < 0.05). In grade VII the majority (94%) were in the concrete stage and in grade IX, the majority (64%) were in the formal stage. Also there were significant differences in the numbers in each stage between grades VII and VIII (chi-square = 18.3, df = 1, p < 0.005) and between grades VIII and IX (chi-square = 7.1, df = 1, p < 0.05). The results were interpreted as indicating that grade VIII acted as a transition, or "bridge" grade with no significant differences between the proportion of pupils in each stage.

That the results are not at variance with those of many other researchers was regarded as an indication of the success of the Piagetian questionnaire. Further indication of its success was gained from a comparison of the preceding results with those obtained from the conversation-interview.

(vi) Analysis of Results II: The Interviews

The 57 interviews were analysed by two investigators and the solution to each problem ("hidden magnetism", "chemical combination" and "equilibrium in the balance") classified as "C" (Concrete) or "F" (Formal). The criteria used were taken from Inhelder and Piaget (1958) and are summarised as follows.

<table>
<thead>
<tr>
<th>Criteria used to Classify Subjects' Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concrete Level Solutions</strong></td>
</tr>
<tr>
<td>1. Trial and error attempts to solve problems: no systematic analysis.</td>
</tr>
<tr>
<td>2. Hypotheses not proposed or tested. All available possibilities not tested.</td>
</tr>
<tr>
<td>3. Usually try one - by - one combinations.</td>
</tr>
<tr>
<td>4. Fluctuate from one answer to another. Hold one solution although disproved by some instances.</td>
</tr>
<tr>
<td>5. Can order serially, can classify objects.</td>
</tr>
<tr>
<td><strong>Formal Level Solutions</strong></td>
</tr>
<tr>
<td>1. Work systematically on the available data.</td>
</tr>
<tr>
<td>2. Propose and test hypotheses. Test for implication, non-implication and incompatibility.</td>
</tr>
<tr>
<td>3. Can work with two - by - two combinations.</td>
</tr>
<tr>
<td>4. All possibilities or combinations tested even though one may supply solution.</td>
</tr>
<tr>
<td>5. Capable of proportional operation.</td>
</tr>
</tbody>
</table>
### CRITERIA USED TO CLASSIFY SUBJECTS' SOLUTIONS FOR THE THREE SPECIFIC PROBLEMS

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CONCRETE LEVEL SOLUTIONS</th>
<th>FORMAL LEVEL SOLUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hidden Magnetism</td>
<td>1. Trial and error attempts to solve.</td>
<td>1. Tests possibilities systematically.</td>
</tr>
<tr>
<td></td>
<td>2. May pick weight as the causal factor.</td>
<td>2. Weight eliminated as a causal factor.</td>
</tr>
<tr>
<td></td>
<td>3. Rough forms of disjunction and exclusion appear.</td>
<td>3. Formal operations of disjunction and exclusion are used.</td>
</tr>
<tr>
<td></td>
<td>1. All factors 1 to 4 are combined with g.</td>
<td>1. Factors 1 to 4 are combined with g although may be omitted and two-by-two combinations substituted.</td>
</tr>
<tr>
<td>Chemical Combinations</td>
<td>2. Two-by-two combinations may be tried at random; colour may be obtained by chance.</td>
<td>2. Two-by-two combinations tried systematically. Subject knows what has been done.</td>
</tr>
<tr>
<td></td>
<td>3. Do not cross over between situations, e.g. 1x2i, 2x3, try 1x2, 3x4.</td>
<td>3. All possible combinations tested.</td>
</tr>
<tr>
<td></td>
<td>1. Knows weights required on both arms. Equal weights at equal distances.</td>
<td>1. Knows weights required on both arms. Equal weights at equal distances.</td>
</tr>
<tr>
<td>Equilibrium in the Balance</td>
<td>2. Establishes equilibrium by trial and error.</td>
<td>2. May initially establish equilibrium by trial and error but discovers the proportional relationship between weights and distance from fulcrum.</td>
</tr>
<tr>
<td></td>
<td>3. Realises a heavy weight near fulcrum balances a lighter weight further out.</td>
<td></td>
</tr>
</tbody>
</table>
Interviews and Questionnaire Compared

**Interview Criterion:** one or more F classifications

<table>
<thead>
<tr>
<th>Questionnaire Classification</th>
<th>Concrete</th>
<th>Formal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage Interview Classification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete</td>
<td>19</td>
<td>3</td>
</tr>
<tr>
<td>Formal</td>
<td>12</td>
<td>23</td>
</tr>
</tbody>
</table>

Total = 57

\[ r_\varphi = 0.51 \quad \chi^2 = 14.8 \quad p < 0.0005 \]

Interviews and Questionnaire Compared

**Interview Criterion:** two or more F classifications

<table>
<thead>
<tr>
<th>Questionnaire Classification</th>
<th>Concrete</th>
<th>Formal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage Interview Classification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concrete</td>
<td>27</td>
<td>9</td>
</tr>
<tr>
<td>Formal</td>
<td>4</td>
<td>17</td>
</tr>
</tbody>
</table>

\[ r_\varphi = 0.54 \quad \chi^2 = 16.7 \quad p < 0.0005 \]

The distribution of the 57 pupils in concrete and formal stages with age and grade were similar to those indicated in the Questionnaire situation and when chi-square values were calculated, findings were obtained identical to those reported in the preceding section. The results from the conversation-interview substantiated those from the Questionnaire. The agreement obtained was taken as an additional indication of the success of pencil-and-paper tests in studies of Piaget's theories. There was a 77% agreement in classification between the two techniques. Using the Questionnaire, 26 of the 57 pupils were categorised as belonging to the formal stage, whereas on the basis of the conversation-interview,
21 were categorised as in the formal stage. 34 pupils were placed in the same category by both Questionnaire and interview. Tisher concluded that the high percentage of agreement between Questionnaire and interview classification indicates that both techniques are measures of the same variable. The Tisher study therefore provided contrary evidence in relation to those regarding the conversation-interview as the only technique to be used to check Piaget's theories e.g. Moore (1950 op.cit.). Tisher acknowledges that further research might well lead to the establishment of a higher correlation between Questionnaire and interview results. (Details of the experimental procedures used in the present investigation are given in the Appendices).

(vii) Further empirical validation of the Piagetian Questionnaire

Tisher's Piagetian Questionnaire has been examined by the Australian Science Education Project (1972) in an attempt to establish an "understanding in science test" to assist teachers in determining the Piagetian level of thinking of students. Although Tisher's categories for classification of subjects into stages of mental development were noted, to facilitate categorisation each subject was given a Tisher test score according to the formula:

$$\text{Tisher test score} = \text{concrete score} \times 1 + \text{formal score} \times 2$$

The categories were then modified as follows:

<table>
<thead>
<tr>
<th>Category</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>early concrete</td>
<td>0-10</td>
</tr>
<tr>
<td>late concrete</td>
<td>11-19</td>
</tr>
<tr>
<td>early formal</td>
<td>20-26</td>
</tr>
<tr>
<td>late formal</td>
<td>27-34</td>
</tr>
</tbody>
</table>

The Australian Science Education Project concluded that the Questionnaire had validity as a measure of Piagetian developmental level.

Field and Cropley (1969) in an investigation into cognitive style and science achievement employed Tisher's questionnaire to yield a measure of stage of mental operations, among 178 fifth and sixth form pupils with a mean IQ of 117. They report that the Questionnaire placed 30 of the subjects at the Concrete, 104 at the Formal and
44 at Late Formal levels of operational thought. High science achievement appeared to be associated with the ability to apply formal operations in processing science information.

In a study with respect to Formal Operations involving 78 subjects (32 males and 46 females), 6th (representative of early adolescents) and 10th (representative of middle adolescents) grade students, Ross (1974) employed Tisher's Questionnaire as a measure demonstrated thinking at the formal level, while 22% of the "sixth-high" subjects of formal operational thinking. Virtually no "sixth-grade" subjects operated formally. At the tenth grade level, 40% of the moderate achievers functioned formally and 43% of the high achievers were classified at the formal level. The general and significant increase in formal thinking from early to middle adolescence can be said not only to support Piaget's theory of adolescent cognitive development, but to give credibility to the Questionnaire of Tisher in its ability to discriminate between varying levels of logical ability. It further supports other researchers and Piaget's (1972) modification of his position in stating that in contrast to the earlier stages of cognitive development, e.g. concrete operational, there is likely to be decalage or delay in the onset of the formal operations and that we might expect much development in formal thinking during the ages of 15 through 20. Ross (1975, in private communication) comments that the Tisher Questionnaire appears to stress the formal operation of proportionality rather than the dissociation schema. Ross considers the dissociation schema is more central to the formal operations.

(38) Psychometric and Questionnaire Approaches and Piaget's "Clinical" Method

Many writers have commented upon the common ground between the approaches of developmental psychologists such as Piaget and the work of psychometrists. Elkind (1969) for example, points out the strong emphasis that both place upon the process of logical reasoning. Ward (1972) considers that provided a liberal psychometric attitude can be adopted, some of Piaget's experimental situations form a potential source of items which possess the advantage of having a definite rationale. For this reason, the new British Intelligence
Scale (Varburton 1970) provided for the incorporation of materials and procedures from developmental psychology into a multi-factorial framework.

Tuddenham (1970) comments that Piaget's influence upon the mental test movement has been negligible as his "méthodes clinique", which enables one to shape the dialogue to the responses of the particular child, is almost antithetical to the traditional mental test emphasis upon objectivity, standardisation and quantification. However, when one's purpose is not to formulate or substantiate a normative theory, but rather to compare different children under identical conditions, the method of inquiry must not itself risk introducing variability into the results. Moreover, the interrogation required to elucidate the qualitative subtleties of a child's thinking about a single problem, takes too long for the psychologist to sample any variety in a session of reasonable length. When interested in human variability, related to Piaget, it seems appropriate to convert Piagetian experiments into test items meeting strict psychometric criteria, while conserving in so far as possible the essence of the original problems. Tuddenham's method therefore attempted to synthesise Piagetian theory with methods derived from mental tests.

Shayer and Uharry (1974) acknowledging the advantages of the Piaget-based task in giving insight into the mental strategies of the individual person, focus on the difficulties of assessing the mental levels of a class of children even though the individual topics of the Nuffield Foundation Courses have been assessed in Piagetian terms. They therefore attempted to develop a method of testing a class which would reveal the level of thinking of the individual pupil in the context of the science teaching that the pupil was receiving.
The criteria employed in Sheyar and Wherry's approach appear to follow very closely the qualities inherent in the Fireh test, the most noticeable exception being that Sheyar and Wherry's assessments follow the opportunities pupils have during various class practical activities in connection with the Nuffield Foundation Combined Science Course to develop concepts and laws. The results however, supported Piaget's contentions that a child's attainment of a concept is dependent upon his stage of readiness.

Dulit (1972) attempted a paper and pencil simulation of the "Combinations of Coloured and Colourless Chemical Bodies" experiment in view of the time-consuming nature of the actual experiment and concluded from a scrupulous analysis of the reliability that the approach could be identified as a "different but related" method assessing the same underlying capacities.

Other studies attempting psychometric and questionnaire approaches and Piaget's "clinical" method include: Bart (1972); Burgess (1969); Peel (1971); Tanke, Campbell and Helmick (1970); and Winkelmann (1974, 1975).
2. Measures of Modes of Moral Judgment

Over fifteen years research into the development of moral judgement has led to Kohlberg's theory that individual's acquire and refine their moral judgement through a series of invariant stages. Longitudinal studies, studies in disparate cultures, with children and adults of widely divergent socio-economic backgrounds have supported this developmental theory. Kohlberg commenced his studies fifteen years ago with the notion that there were universal ontogenetic trends toward the development of morality as it has been conceived by Western Moral Philosophers and that the development of such "rational" or "mature"morality is a process different from the learning of various "irrational" or "arbitrary" cultural rules and values. While these notions were assumptions fifteen years ago, Kohlberg claims that longitudinal and cross-cultural research has now turned these assumptions into well verified factual conclusions. The stages briefly stated are as follows:

1. An orientation to punishment and reward; to physical and material power.
2. A hedonistic orientation with beginning notions of reciprocity, but with an emphasis on an exchange of favours.
3. A morality defined by individual ties and relationships, where the approval of others is paramount.
4. An orientation toward authority, law, duty, the maintaining of a fixed order, whether that order be secular or religious.
5. A social contract orientation, with emphasis on equality and mutual obligation within a democratically established order.
6. A morality of individual principles of conscience which are comprehensive and universal. The highest value is placed on justice, the value of human life, equality and dignity.

(Further discussion of these stages is included in Chapter Three: Review of the Literature: The Cognitive-Developmental Approach to Morality).

While concern with justice and fairness, affection and the need for rules may be within a child's comprehension at an early age, it is Kohlberg's contention that such concerns have a "point of entry" into the stages of moral reasoning. Thus the preschooler may spend much time dealing with sharing and fairness notions, but it is only at stage-two that the child first thinks of property rights within an economic system. The young child is extremely responsive to affectional ties, but it is only at stage-three that he thinks of affection beyond one-to-one relationships. At stage-three the child has a high need for affiliation and thinks of how to behave in a moral dilemma in terms of the trust that others
have in him. In imagining how others might respond to his needs, he now thinks not only of what would be "fair" but of what a "nice" person would want to do. Compared to principled levels of moral reasoning, stage-four thinking may look petty and limited, however it is important to remember that at stage-four, morality is seen in society's perspective for the first time. This is an advance over stage-three thinking, which reasons just in relation to individuals. This is true despite the fact that principled persons will place the rights of individuals above the rules of society on some occasions. Not only is stage-four thinking "respectable" and well-suited to the needs of many everyday decisions, in a genuinely just society it might be unnecessary for individuals to grow beyond it.

It is important to note that while the issues mentioned are the major concern of that stage, they are not the only concern. The difference is one of emphasis. The stages are not mutually exclusive, but it is possible for a person to be in transition between two of them, or to be predominantly at one of them, but exhibit some thinking at the level immediately above and/or immediately below. Each stage incorporates certain features of the previous one, rather than making a complete break with the previous stage.

Kohlberg (1958) has devised an instrument through which to measure moral judgement: hypothetical moral dilemmas are presented, followed by a series of questions which ask the subject to resolve the dilemma and then probe into the reasons leading the subject to make his decision. Kohlberg (1971) describes his hypothetical moral dilemmas as deliberately "philosophical", some found in medieval works of casuistry.

Kohlberg's Moral Judgement Stories

<table>
<thead>
<tr>
<th>MORAL FORM A</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
</tr>
<tr>
<td>Heinz steals the drug - Law vs. Moral - Life</td>
</tr>
<tr>
<td>IV</td>
</tr>
<tr>
<td>The wife wants euthanasia - Law vs. Moral - Life</td>
</tr>
<tr>
<td>I</td>
</tr>
<tr>
<td>The father breaks his promise - Family Roles vs. Justice - Property</td>
</tr>
<tr>
<td>II</td>
</tr>
<tr>
<td>The son tells a lie - Family Roles vs. Justice - Truth</td>
</tr>
</tbody>
</table>
Forms A and B are equivalent forms. Additional stories on sex and civil rights are provided for each form plus five further stories if required. (The details of all the above stories together with the range of probes devised by Kohlberg are included in the Appendices).

Scoring

It is the reasoning process which is of interest and Kohlberg has delineated criteria by which responses can be scored on a variety of dimensions according to a developmental scale of maturity of moral judgements.

Kohlberg is developing his methods and techniques continuously and has changed his approaches throughout the years. The most recent guide to Issue Scoring focuses on the three methods of scoring: by story, by issue, and by orientation (aspect). Story scoring is considered sufficient for students and educators interested in understanding moral research, issue scoring being a more reliable and valid method for formal research. Complete aspect scoring is the method required for longitudinal and cross-cultural work.

Issue Scoring

Kohlberg stresses the special demands moral judgement interviewing and scoring makes, not made by other forms of psychological testing and scoring. If the thinking of the social scientist in the moral domain is not organised at the principled level, he will not easily recognise or understand principled thinking in his subjects.

Structural scoring depends upon the concept of the issue. Kohlberg relates that the initial tendency in the earlier work was to develop a global stereotype of a stage and then apply it to one story after another; this sometimes led to generating a score of Stage 6 for Story III and Stage 2 for Story IV. Of further concern was the extreme mixtures of stages found within a story, e.g. Stage 1 (4) or 2 (5). Further analysis indicated that these inconsistencies were due to different stories tapping different issues, each story tapping more than one issue.
The individual, it was found, could be at different stages on different issues, but he could not be at widely differing stages on the same issue on different stories. This was proved by correlation, factor analysis and scaling studies. A single story did not yield enough information for an accurate stage classification on an issue. Accordingly, the notion of using a two-story unit, then a total four-story unit to assign a stage score on an issue was initiated. Typically, it was found that when the stance on life in Story III was put together with a stance on Story IV, a single stage score emerged. Accordingly it is assumed an individual is stage consistent across stories on a particular issue: i.e. varies over no more than two adjacent stages. The fundamental purpose of the issue system therefore is to define the unit on which a person is stage-consistent. Moral situations are as a consequence thought of as moral situations involving recurrent issues in conflict with one another. The procedure as a result therefore calls for: labelling issues on stories and assigning a simple stage score on each issue across scores (as well as scores on the issue for a particular story). If adult subjects are questioned with respect to the issues involved in a moral conflict situation, e.g. "Heinz steals the drug", they will tend to answer in terms of the list of issues provided by Kohlberg: the need to save a human life (Issue H); the druggists property rights (Issue I); and the law against theft (Issue A). "Issues" can therefore be clarified as defining the concrete objects of concern or of value in the situation. Secondly, they are "the things to be defined and chosen between in the situation", they define the moral conflict. The moral conflict situations are conflicts between concerns for one issue and for another. "Heinz steals the drug" is for some subjects, a conflict between the issues (or values) of love relationships versus law etc. These issues are also what are called "values": a person values law, property and life and these values may come in conflict with one another.

Kohlberg's detailed Issue Manual (1971b) includes a short-form definition of Stages by Issues, then a lengthier definition of Stages by Issue: the Detailed Issue Manual. (The Short-Form definition of Stages by Issues is included in the Appendices).

Scoring proceeds through analysis of 2-situation units as both situations tend to focus on many of the same issues; two, two-situation units are grouped together to make a form. The groupings have been illustrated previously within this section and are further detailed in the Appendices. Initially, the protocol is read as a whole, issue labels being tentatively assigned in the margin adjacent to the main responses in which the Issue is being discussed. In order to clarify
and unify the various ideas which lead to a stage score on a given issue, the issue as a whole is paraphrased. Having arrived at a paraphrase on an issue, it is then compared with the general definition of the stages on the Issues (Short-Form and Long-Form).

The final issue scores are given a stage and a weight. Weight-marked percentage scores on each stage are then generated, from which a modal score and a moral maturity score are derived. The major score of the individual is that on which he has more than 50% response. A minor score is given if 25% or more of his responses are in a second stage. A profile of each subject is therefore formed from the percentage of statements given at each stage. In addition to classifying the subject in terms of the stage most used, this profile of percent usage of each stage yields a moral maturity score ("MMS"). The "MMS" is the sum of the products of the percentages in a "profile" multiplied by ordinal value or number of the stage. The maximum MMS is 600 (100% Stage 6), the minimum is 100 (100% Stage 1).

Standard or Short Form Scoring

In this scoring method, two issues only, per story are scored. The issues are as follows:

Form A
(Story III - Heinz steals the drug  Issue - G, Issue - H
Story IV - The wife wants euthanasia  Issue - G, Issue - H
Story 1 - The father breaks his promise  Issue - C, Issue - F
Story 2 - The son tells a lie  Issue - C, Issue - F

Form B
(Story VII - One brother steals, the other "cone"  Issue - B, Issue - F
Story VIII - The reformed criminal hasn't served his jail term  Issue - D, Issue - G
Story V - The captain orders a man to his death  Issue - D, Issue - H
Story VI - Choose the sickman or the troublemaker  Issue - D, Issue - H

The moral maturity score is computed by a solid stage score (indicated by a clear stage number, e.g. 3 for Stage 3) receiving a weight of 1. An ambiguous score indicate by "A" inserted before the queried stage number, weighted ½. The Moral Maturity Score is as stated before, a computation which represents the percentage usage at various stages. Moral Maturity Scores range from 100 to 600 (100 corresponding to a pure Stage-1 and 600 corresponding to a pure Stage-6). A pure stage is allocated when at least 75% of reasoning is at that stage. E.g. MMS of 376 = Stage 4. A minor stage is given when reasoning amounts to at least 25% at that stage e.g. MMS of 360 is Stage 4 (3) (40% Stage 3, 60% Stage 4). MMS of 330 is a 3 (4) (30% Stage 4, 70% Stage 3).
Validation

It might be expected that subjects would respond most enthusiastically to realistic dilemmas; perhaps to dilemmas closest to real-life situations that they have experienced. The experience of Kohlberg and his colleagues has proved this assumption to be unfounded. Even when a genuine moral dilemma is currently in the news, discussion groups have tended to respond with greater involvement - and with greater contrast of opinion - to the artificially developed dilemmas.

However, the present investigator considers that some reliability can be given to several of the situations presented with respect to their authenticity to everyday situations. Euthanasia has always been debated and recently was prevalent in the news through the writings of a retired Senior Surgeon who described the large number of "mercy-killings" administered to terminal patients at their own request. He admitted the illegality and the unethical nature of euthanasia but that it was merciful to the people concerned. A further incident concerns the Nursing Sister sentenced to life imprisonment after being found guilty of "murdering" an elderly patient in the geriatric ward, by illegally injecting her with insulin. The motive was not discovered, the Sister declared passionately that euthanasia was against her principles. It is interesting also to note that a recent bid to bring in the death penalty for terrorists was rejected by a 152 majority in the Commons. Dr Christian Barnard in his autobiography writes of his experience of the drive towards carrying out euthanasia by "the same impulse that causes a man to be a doctor", and the wrestling with the memory of the Hippocratic Oath and personal ethic together with the laws of social men.

The question has been raised concerning whether or not subjects can tailor their answers so that they will "rate" higher on the moral judgement stage sequence. Interviewers at Harvard feel that the number of dilemmas they present, and the variety of responses they elicit when they ask subjects for opinions if the circumstances in the dilemmas are slightly altered, make this kind of "pretence" unlikely. They also point out that no one response determines a stage placement, but that fifty per-cent or more of the responses tend to cluster within one stage.

Kohlberg (1971) cites his longitudinal study of American boys at ages 10, 13, 16, 19 and 23 as evidence for the invariant sequence of stages. (Kohlberg, 1963, 1969). The cultural universality of the sequence of stages has been shown from studies in various cultures (Kohlberg, 1971) suggesting that the same basic ways of moral valuing are found in every culture and develop in the same order. No important differences have been found in the development of moral thinking.
among subjects of varying religions suggesting that religious factors are not unique causes of the development of basic moral values. Research by Rest, Turiel and Kohlberg (1969) and Rest (1973) imply that the stages constitute a hierarchy of cognitive difficulty with lower stages available to, but not used by those at higher stages. Further, that stages constitute an order of moral adequacy: from studies by Turiel, 1966; Rest, Turiel and Kohlberg (1969); Blatt and Kohlberg (1971 and Rest (1973) it has been "clearly and consistently verified" that subjects assimilate most moral judgements one stage above their own, and assimilate much less those which are two or more stages above, or one or more stages below their own.

Furthermore, moral judgement has generality as a measure of morality in that it has been shown to relate to measures of guilt (Ruma and Mosher 1967) and shows a positive correspondence with morality of behaviour (Kohlberg 1965). Kohlberg (1969) reports a product moment correlation between maturity of moral judgement scores and ratings of conscience of .46. Kohlberg (1969, 1971) reports a study by Brown et. al. (1969) in which principled college students appear much less likely to cheat than conventional subjects. Further, a study by Krebs (1967) indicated that 75% of the conventional and preconventional children cheated on at least one of four experimental cheating tests while only 2% of the principled children did so. Haan (1968) reports that 50% of Stage-5 subjects and 80% of Stage-5 subjects sat in at the Administrative Building of the University of California to preserve the rights of political free speech on the campus, with only 10% of students at the conventional level protesting. Freundlich and Kohlberg (1971) report that 65% of 15 - 17 year old working-class delinquents are preconventional whereas only a minority (25%) of working-class adolescents who are not delinquent are preconventional. Although Kohlberg considers that more research needs to be conducted existing evidence clearly supports a positive relationship between stage of reasoning and moral behaviour.

Grimley (1974) in a cross-cultural replication of Kohlberg's work reports that although the parameters in moral development (e.g. rate of development, dispersion of moral maturity scores etc.) were found to vary among subjects from Zambia, U.S., Hong Kong, Japan and England, no significant differences between nationalities were found in the development of moral judgement. Similarly religious background did not account for any significant differences in the development of moral reasoning. Further replicatory and extension studies of Kohlberg's research have been discussed in Chapter Three- Review of the Literature: The Cognitive-Developmental Approach to Morality.
Administration of the Kohlberg Dilemmas in the Present Investigation

Dilemmas III, IV, V, VI, VII and VIII were administered to all subjects in the Sample in School Groups. Copies of the dilemmas were presented to each subject and were followed by the range of probes, as set out and devised by Kohlberg for use in group testing or as a standardized guide for questioning in individual interviews, to which the subjects recorded their responses. The dilemmas were presented in the order set out in Chapter Four. Each dilemma was introduced and read to the group as a whole and further elaboration was undertaken with respect to anticipated difficulties with vocabulary or understanding of what was required. Subjects were allowed to ask for further clarification of the meaning of particular probes throughout the testing situation if necessary. The responses were not timed and were completed after the session time was fulfilled if necessary. As described by Kohlberg, the situations were motivationally stimulating to the subjects although the frequency of being required to respond to "why" had to be acknowledged by the investigator sympathetically and its importance justified. Copies of the dilemmas and the respective probes are included in the Appendices. It will be noted that the dilemmas presented include the whole of Form B, plus two situations from Form A, dupliating the tapping of the life and punishment issues. It was considered this would add further reliability to the written form of testing. Scoring was in accordance with Kohlberg's Standard or Short-Form scoring described earlier.
CHAPTER SIX

ANALYSIS OF THE RESULTS

A. PIAGETIAN OPERATIONS IN RELATION TO MORAL DEVELOPMENT:
A TEST OF THE MAIN HYPOTHESIS.


2. Quantitative Discussion and Qualitative Observations
   of the Piagetian Results in relation to Moral Judgement.

3. Discussion and Interpretation of the Results.

B. SUBSIDIARY HYPOTHESIS

C. ADDITIONAL ANALYSES
1. Statistical Treatment of the Date Criterion for Groups

The overall design for investigation involved the administration of Kohlberg's Moral Judgement Interview to populations contrasted in respect of Piagetian "Concrete" and "Formal" operativity (Tisher 1962, 1971) and precision matched in terms of extraneous variables, namely IQ, age, sex and socio-economic status.

The total sample of 231 subjects represented a range of intelligence levels, socio-economic status categories, an age range from 14 to 15+ years and both sexes. Differing criteria (as defined below) were employed to establish matched-pair groups of varying sizes. This necessitated the inclusion of some subjects more than once.

Group 1 "Concrete" and "Formal" (N = 55 + 35 = 70): represents groups contrasted according to lower ("Concrete") and upper ("Formal") levels of logical thinking (patterned after Tisher's Piagetian Questionnaire op. cit.) and matched according to Raven's Categories (mean scores for "Concrete" and "Formal" = 51.0, 51.2, respectively); Mill Hill Vocabulary Categories (mean scores for "Concrete" and "Formal" = 50.5, 50.7, respectively); within 6 months of chronological age (mean age for "Concrete" = 180.3 months and mean age for "Formal" = 181.5 months); sex and socio-economic status.

Group 2 "Concrete" and "Formal" (N = 33 + 33 = 66): represents groups contrasted in terms of the lower ("Concrete") and upper ("Formal") regions of logical thinking scores (the cut-off point being established by cross-tabulation) and then matched on Raven's Categories (mean scores for "Concrete" and "Formal" = 49.9, 50.3, respectively); within six months of chronological age (mean age for "Concrete" = 180.8 months and "Formal" = 182.0 months); sex and socio-economic status; all matched according to "tight bands" within and across levels of logical thinking.

Group 3 "Concrete" and "Formal" (N = 46 + 46 = 92): represents groups contrasted in terms of the lower ("Concrete") and upper ("Formal") regions of logical reasoning (the cut-off point being established by cross-tabulation) and matched according to Raven's Categories (mean scores for "Concrete" and "Formal" = 49.6, 50.1, respectively); within six months of chronological age (mean age for "Concrete" and "Formal" = 181.0, 181.8 months respectively); sex and socio-economic status.
Group 1 "Concrete" and "Formal" ($N = 65, 65 = 130$) represents groups contrasted in terms of the lower ("Concrete") and upper ("Formal") of logical reasoning scores (following the "weighting" procedures of the Australian Science Education Project 1972, 1974). Subjects were then matched on the basis of five Raven's points (mean scores for "Concrete" and "Formal" = 47.7, 49.6, respectively), within 8 months of chronological age (mean ages for "Concrete" and "Formal" = 179.3, 180.7 months, respectively); sex and socio-economic status.

**Statistical Treatment**

The data were subjected to the following types of analysis:

(a) Student's t-test;
(b) Correlation coefficients; and
(c) Stepwise Multiple Regression Analysis.

To test whether the performance of the Piagetian Stage groups were statistically different when compared with each other, Student's t-test was used. Table 6.1 shows the levels of probability values of $t$. It will be seen that Moral Maturity rejected the null-hypothesis of no difference for the performance of the Piagetian-Stage groups 1 and 2 at the .01 significance level or below and groups 3 and 4 at the .1% significance level or better. However, group 4 shows a highly significant difference on Mill Hill which could be due to relatively less precise matching.

However, the use of the matched groups technique introduces an element of selection and cannot be considered representative. Correlations coefficients were therefore computed to indicate the strength or absence of associations between pairs of variables. These correlations coefficients, extracted from the main body of data, are presented in Tables 6.3 and 6.4 (the complete correlation matrix, Table 6.5 is likewise included). Means and standard deviations are presented in Table 6.2.

It will be seen (Table 6.3) that the "Concrete" level of thinking is positively correlated to age ($r = .202$), Raven's ($r = .482$), Mill Hill ($r = .462$) and Moral Maturity ($r = .429$). Similar patterns are indicated for the "Formal" level of thinking; age ($r = .247$), Raven's ($r = .503$), Mill Hill ($r = .404$) and Moral Maturity ($r = .427$). Sex shows no correlation ($r = -.074$). Neither does SES, as measured by the Registrar General's Classification when compared with "Formal" operativity ($r = -.086$). However, at the "Concrete" level of thinking SES is negatively correlated ($r = -.179$).

Inspection of the correlations reported in Table 6.4 demonstrates that the variables of "Concrete" and "Formal" (combined) thinking are positively correlated to age ($r = .255$), Raven's ($r = .548$), Mill Hill ($r = .469$) and Moral Maturity ($r = .472$). Sex shows no correlation ($r = -.036$). Neither does SES indicate
<table>
<thead>
<tr>
<th>Group</th>
<th>Age</th>
<th>Raven</th>
<th>Mill Hill</th>
<th>Moral Maturity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designation</td>
<td>n</td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>1</td>
<td>&quot;Concrete&quot;</td>
<td>35</td>
<td>100.3</td>
<td>5.9</td>
</tr>
<tr>
<td></td>
<td>&quot;Formal&quot;</td>
<td>35</td>
<td>100.2</td>
<td>5.9</td>
</tr>
<tr>
<td>2</td>
<td>&quot;Concrete&quot;</td>
<td>33</td>
<td>160.0</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td>&quot;Formal&quot;</td>
<td>33</td>
<td>182.0</td>
<td>4.8</td>
</tr>
<tr>
<td>3</td>
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<td>46</td>
<td>101.0</td>
<td>5.4</td>
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<td></td>
<td>&quot;Formal&quot;</td>
<td>46</td>
<td>101.8</td>
<td>5.3</td>
</tr>
<tr>
<td>4</td>
<td>&quot;Concrete&quot;</td>
<td>65</td>
<td>179.3</td>
<td>5.7</td>
</tr>
<tr>
<td></td>
<td>&quot;Formal&quot;</td>
<td>65</td>
<td>180.7</td>
<td>6.2</td>
</tr>
</tbody>
</table>

Levels of probability values of t  
* < .05  
** < .01  
*** < .001  

all other t values not significant
TABLE 6.2
MEANS AND SD's OF THE EIGHT MEASURES FOR THE TOTAL SAMPLE (N=231)

<table>
<thead>
<tr>
<th>Variable/Name</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Var 1   Sex</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Var 2   Age</td>
<td>180.186</td>
<td>6.976</td>
</tr>
<tr>
<td>Var 3   Social Class</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Var 4   Ravens</td>
<td>48.208</td>
<td>6.445</td>
</tr>
<tr>
<td>Var 5   Mill Hill</td>
<td>47.225</td>
<td>8.509</td>
</tr>
<tr>
<td>Var 6   Concrete</td>
<td>10.333</td>
<td>2.474</td>
</tr>
<tr>
<td>Var 7   Formal</td>
<td>3.840</td>
<td>2.211</td>
</tr>
<tr>
<td>Vars 6 &amp; Combined 7</td>
<td>18.013</td>
<td>6.242</td>
</tr>
<tr>
<td>Var 8   Moral</td>
<td>307.913</td>
<td>32.014</td>
</tr>
</tbody>
</table>
## Table 6.3

Correlations between Operations (Concrete/Formal) and All Other Variables

<table>
<thead>
<tr>
<th></th>
<th>Sex (Variable 1)</th>
<th>Age (Variable 2)</th>
<th>SES (Variable 3)</th>
<th>Ravens (Variable 4)</th>
<th>Mill Hill (Variable 5)</th>
<th>Moral (Variable 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Concrete</strong></td>
<td>-.074</td>
<td>.202**</td>
<td>-.179**</td>
<td>.482**</td>
<td>.462**</td>
<td>.429**</td>
</tr>
<tr>
<td>(Variable 6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Formal</strong></td>
<td>-.008</td>
<td>.247**</td>
<td>-.086</td>
<td>.503**</td>
<td>.404**</td>
<td>.427**</td>
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<tr>
<td>(Variable 7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 231

** Significant where p < .001
* Significant where p < .005
### TABLE 6.4

**CORRELATIONS BETWEEN PIAGET TOTAL AND ALL OTHER VARIABLES**

<table>
<thead>
<tr>
<th>Sex (Variable 1)</th>
<th>Age (Variable 2)</th>
<th>SES (Variable 3)</th>
<th>Ravens (Variable 4)</th>
<th>Mill Hill (Variable 5)</th>
<th>Moral (Variable 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piaget Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(&quot;Concrete&quot; and</td>
<td>-.036</td>
<td>.255**</td>
<td>-.132</td>
<td>.548**</td>
<td>.469**</td>
</tr>
<tr>
<td>&quot;Formal&quot;)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Var 6 and Var 7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.472**</td>
</tr>
</tbody>
</table>

N = 231

** Significant where p < .001

* Significant where p < .005
<table>
<thead>
<tr>
<th></th>
<th>Sex</th>
<th>Age</th>
<th>SES</th>
<th>Ravena</th>
<th>Mill Hill</th>
<th>&quot;Concrete&quot;</th>
<th>&quot;Formal&quot;</th>
<th>Moral</th>
</tr>
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<tbody>
<tr>
<td>Sex</td>
<td>.017</td>
<td>.112</td>
<td>.014</td>
<td>-.197</td>
<td>-.074</td>
<td>-.009</td>
<td>-.087</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>.204 ***</td>
<td>.260 ***</td>
<td>.287 **</td>
<td>.202 **</td>
<td>.247 **</td>
<td>.171 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SES</td>
<td>-.157</td>
<td>-.198 *</td>
<td>-.179 *</td>
<td>-.086</td>
<td>-.021</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ravena</td>
<td></td>
<td>.549 **</td>
<td>.482 **</td>
<td>.503 **</td>
<td>.306 **</td>
<td>.351 **</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mill Hill</td>
<td></td>
<td>.462 **</td>
<td>.404 **</td>
<td>.609 **</td>
<td>.429 **</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Concrete&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.427 **</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Formal&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>Moral</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 231

** significant where p < .001
* significant where p < .005
any significant relationship ($r = -.132$).

The most obvious danger of the correlational method is a tendency to infer causality when only association has been established.

Whereas the correlation coefficient measures the linear relationship between a dependent variable and one independent variable, multiple regression techniques measure the relationship of the dependent variable with several independent variables. The variables were included in a Stepwise Regression Analysis which might accurately predict Moral Maturity (Kohlberg). Summary Tables (6.6, 6.7) are reproduced for interpretation. The Moral Maturity Total was used as the dependent variable and "Concrete", "Formal", Mill Hill, SES, sex, age and Raven's variables were used as the independent variables. The independent variable (Table 6.6) which accounts for the greatest amount of variance is the one which has the highest correlation with the dependent variable. In this case, it is "Concrete". Stepwise Regression procedure then introduces the further variable which in combination with "Concrete", accounts for the highest amount of variance. This combination is arrived at by elimination of intercorrelation between independent variables. In other words, that proportion of the second variable which measures essentially the same characteristics as the first is eliminated and only that part which measures a different characteristic is retained. Table 6.6 shows "Formal" to be the best variable in combination with "Concrete". The table shows changes in $R^2$ occurring with successive independent variables included. The third variable is Mill Hill (vocabulary). This factor, however, accounts for a very small percentage increase in the value of $R^2$. The increase in value of $R^2$ associated with the addition of further variables is negligible. So that any characteristics these variables possess have already been accounted for by the combination already described (i.e. "Concrete", "Formal" and Mill Hill).

In this analysis therefore, a combination of the three cognitive factors, "Concrete", "Formal" and Mill Hill, effectively encompass the whole spectrum of Kohlberg moral judgement as measured by the remainder of the variables. An individual adolescent exhibiting a combination of such cognitive traits of verbal fluency, concrete and formal (abstract) operations is likely to be more morally mature than an adolescent with verbal deficits and poor reasoning.

Stepwise Regression need not yield the optimum combination of independent variables although it always produces a very good approximation. To discover whether better solutions existed it was decided to combine the "Concrete" and "Formal" variables: psychologically and statistically it was felt that the formal scores might be of
greater importance and therefore appropriate for them to be weighted twice
to the concrete scores; and further, to see whether a different combination
of independent variables was produced. However, in operational terms, no
differences were computed and the same combination and order of variables was
exhibited as in the previous analysis. However, it will be observed that
Multiple R for "Formal" in combination with "Concrete" in Table 6.6 is .477,
whereas in Table 6.7 it is .472.
<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Multiple R</th>
<th>R Square</th>
<th>RSQ Change</th>
<th>Simple R</th>
<th>B</th>
<th>Beta</th>
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<tr>
<td>&quot;Concrete&quot;</td>
<td>.429</td>
<td>.184</td>
<td>.184</td>
<td>.429</td>
<td>2.288</td>
<td>.223</td>
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<td>&quot;Formal&quot;</td>
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<td>.228</td>
<td>.044</td>
<td>.427</td>
<td>3.308</td>
<td>.228</td>
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<tr>
<td>Mill Hill</td>
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<td>.019</td>
<td>.351</td>
<td>.580</td>
<td>.154</td>
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<td>SES</td>
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<td>2.993</td>
<td>-.046</td>
</tr>
<tr>
<td>Age</td>
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<td>.253</td>
<td>.000</td>
<td>-.171</td>
<td>.041</td>
<td>.009</td>
</tr>
<tr>
<td>Ravens</td>
<td>.504</td>
<td>.254</td>
<td>.000</td>
<td>.306</td>
<td>.044</td>
<td>.009</td>
</tr>
<tr>
<td>(Constant)</td>
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<td>R Square</td>
<td>RSQ Change</td>
<td>Simple R</td>
<td>B</td>
<td></td>
</tr>
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<td>----------------------</td>
<td>------------</td>
<td>----------</td>
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<td></td>
</tr>
<tr>
<td>&quot;Concrete&quot; and &quot;Formal&quot;</td>
<td>.472</td>
<td>.223</td>
<td>.223</td>
<td>.472</td>
<td>2.034</td>
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<td>Mill Hill</td>
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<td>.245</td>
<td>.022</td>
<td>.351</td>
<td>.610</td>
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<tr>
<td>SES</td>
<td>.499</td>
<td>.249</td>
<td>.004</td>
<td>-.021</td>
<td>2.480</td>
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<tr>
<td>Sex</td>
<td>.501</td>
<td>.251</td>
<td>.002</td>
<td>-.007</td>
<td>-3.143</td>
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<tr>
<td>Age</td>
<td>.501</td>
<td>.251</td>
<td>.000</td>
<td>.171</td>
<td>.037</td>
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</tr>
<tr>
<td>Ravens</td>
<td>.501</td>
<td>.251</td>
<td>.000</td>
<td>.306</td>
<td>.046</td>
<td></td>
</tr>
<tr>
<td>(Constant)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>233.185</td>
<td></td>
</tr>
</tbody>
</table>
The distinction between quantitative and qualitative differences in cognitive processes among different groups in this investigation is also basic to the thinking within the Piagetian framework. Piaget has mainly been concerned with the qualitative aspects of intellectual development: basic structures of processes and their organization into a hierarchical succession of stages. Further, in elaboration of Piaget's work Kohlberg has been intent to determine a differentiated scale of levels of moral judgement, developmental in nature. Of basic concern in this section is therefore an investigation of the qualitative occurrence and sequence of the logical stages, the determination of differences in the rates of development among individuals of a similar chronological age, and a comparison of various specified groups in relation to modes of moral judgement. The comparative approach also enables a quantitative analysis of this development.

The section is divided into four main parts, each corresponding to the four experiments in the Piagetian Questionnaire. Preceding the main discussion of each test are Tables which summarize the percentage distribution of subjects in each experimental group representing higher levels of logical thinking ("formal") and lower levels of logical thinking ("concrete") with respect to their scores on the specified test and in relation to the various stages of moral judgement. An additional section reports the overall Piagetian results in relation to moral judgement and further, to other replications concrete/formal operational studies.

Titcher's (1962, 1971) criteria based on Inhelder and Piaget (1953) for scoring and classifying the logical responses were employed, together with Kohlberg's Standard Short-Form Scoring approaches to assessing the moral judgement responses. A selection of protocols, totalling 60 dilemmas (30, 2-situation-story units) were reassessed by a staff member in Kohlberg's
Laboratory of Human Development at the University of Harvard
and a high inter-judge reliability was obtained. The percentages
in the Tables are expedient in describing the nature, quantity
(number) and quality (logical) of the main relationships under
study.

In taking each Piaget test in turn, it is proposed to make
further divisions according to the following pattern: the
rationale of the various Piagetian tests, together with the
procedure and general characteristics of the task; the procedures
followed in the present investigation; discussion of the data
summarized in the Tables; the extent to which the results of
the present investigation substantiate or refute the views of
the Geneva School and subsequent researches, and the relation
of the logical thinking results to the modes of moral judgement.
However, there is no guarantee that the Piagetian results in the
various reported researches are strictly comparable, for the
techniques, scoring methods, age ranges, the extent to which
verbalization is taken into account and indeed the whole
conceptualization of Piaget's framework, vary a great deal from
one investigation to the other (cf. Goodnow, 1969).

Each Piagetian test is preceded by four Tables which
correspond to the various matching procedures and criteria
utilized in forming the Piagetian Stage groups. The total sample
of 231 subjects represented a range of intelligence levels,
socio-economic status categories, an age range from 14 to 15+
years and both sexes. It was therefore essential to exercise
controls on the basis of matched pairs. The Piagetian Stage
Groups included (the statistical analysis with respect to the
groups has been reported in a previous section).

Table 1 ($n = 35 \times 35 = 70$): represents groups contrasted
according to Thaler (op.cit.) and matched according to Raven's
categories; Mill Hill Vocabulary categories; within 6 months of
chronological age; sex and socio-economic status.
Table 2 \((N = 33 + 33 = 66)\) : represents groups falling into the upper and lower regions of logical thinking scores (the cut-off point being established by cross-tabulation) "tightly" matched according to "bands" within each region; Raven's categories; within 6 months of chronological age; sex and socio-economic status.

Table 3 \((N = 46 + 46 = 92)\) : represents groups falling into the upper and lower regions of logical reasoning (the cut-off point being established by cross-tabulation) matched according to Raven's categories; within 6 months of chronological age; sex and socio-economic status.

Table 4 \((N = 65 + 65 = 130)\) : represents groups falling into the upper and lower regions of logical reasoning scores (following the procedures of the Australian Science Education Project, 1972/1974). Subjects were then matched on the basis of 5 Raven's points; within 8 months of chronological age; sex and socio-economic status.

It needs to be emphasized that when referring to the subjects displaying higher levels of logical thinking as "formal" and those subjects displaying lower levels of logical thinking as "concrete", in the main, (unless otherwise stated), "early formal" stages and "late concrete" stages are being referred to. The majority of the subjects in the total sample displayed thinking discernible at these particular levels.

The categories of upper and lower for the Piagetian scores were patterned after the Australian Science Education Project (1972; 1974) and Tisher (1962, 1971).
### TABLE 6.8.1 - ANGLES OF INCIDENCE AND REFLECTION

The table summarizes the percentage distribution on this test, of subjects in each matched group \((n = 35 \times 35 = 70)\) "Concrete/Formal" in relation to Stages of Moral Judgement.

<table>
<thead>
<tr>
<th>Moral Stages</th>
<th>Moral Judgement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level of Operativity</strong></td>
<td><strong>Stages 2(3); 3(2)</strong></td>
</tr>
<tr>
<td>Level of Operativity</td>
<td><strong>Score</strong></td>
</tr>
<tr>
<td>Lower levels of logical thinking</td>
<td>Above 7</td>
</tr>
<tr>
<td>&quot;Concrete&quot; and below</td>
<td>18</td>
</tr>
<tr>
<td>Higher levels of logical thinking</td>
<td>Above 7</td>
</tr>
<tr>
<td>&quot;Formal&quot; and below</td>
<td>9</td>
</tr>
</tbody>
</table>
### Table - 6.8.2. Angles of Incidence and Reflection

The table summarizes the percentage distribution, on this test, of subjects in each matched group (N = 33 + 33 = 66). "Concrete/formal" in relation to Modes of Moral Judgment.

<table>
<thead>
<tr>
<th>Level of Operativity</th>
<th>Moral Stages 2(3) 3(2)</th>
<th>Stage 3</th>
<th>Stages 3(4) 4(5) 4</th>
<th>Stages 4(5)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
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<td><strong>Lower levels</strong></td>
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<td></td>
</tr>
<tr>
<td>of logical thinking</td>
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<td></td>
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<td>&quot;Concrete&quot;</td>
<td>7</td>
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<td>18</td>
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</tr>
<tr>
<td><strong>Higher levels</strong></td>
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<td></td>
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</tr>
<tr>
<td>Above</td>
<td>7</td>
<td>12</td>
<td>47</td>
<td>69</td>
</tr>
<tr>
<td>of logical thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;formal&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>59</td>
<td>56</td>
<td>36</td>
</tr>
</tbody>
</table>
TABLE 6.8.3. - ANGLES OF INCIDENCE AND REFLECTION

The Table summarizes the percentage distribution, on this test, of subjects in each matched group (N = 46 + 46 = 92) "Concrete"/"Formal" in relation to Modes of Moral Judgement.

<table>
<thead>
<tr>
<th>Level of Operativity</th>
<th>Moral Stages</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stages 2(3); 3(2); Stage 3; Stages 3(4); 4(3); 4; Stages 4(5); 5(4);</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boys Girls Boys Girls Boys Girls Boys Girls</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower levels of logical thinking</td>
<td>Above 7 12 28 19 16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Concrete&quot; and below</td>
<td>7 4 14 36 62 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher levels of logical thinking</td>
<td>Above 7 64 48 20 38 4 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Formal&quot; and below</td>
<td>7 10 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE 6.2.1 - ANGLES OF INCIDENCE AND REFLECTION

The Table summarizes the percentage distribution, on this test, of subject in each matched group (N = 65 + 65 = 130) "Concrete"/"Formal" in relation to Modes of Moral Judgement.

<table>
<thead>
<tr>
<th>Level of Operativity</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower levels of logical thinking</td>
<td>Score Above</td>
<td>7</td>
<td>6</td>
<td>3</td>
<td>18</td>
<td>22</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>&quot;Concrete&quot; and below</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher levels of logical thinking</td>
<td>Above</td>
<td>7</td>
<td>60</td>
<td>59</td>
<td>36</td>
<td>22</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>&quot;Formal&quot; and below</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
</tbody>
</table>
Piaget (Inhelder and Piaget 1956) comments that his aim in the Chapter on the Equality of Angles of Incidence and Reflection and the Operations of Reciprocation (pp. 3-19) was not a systematic study of the equality of two angles, for he already was aware that this concept is first acquired at the level of concrete operations (Piaget and Inhelder, 1956). It is however precisely the fact that the concept is already so well known by the time the formal level is reached that makes the reasoning process involved in the discovery of the equality between two angles of incidence and reflection so instructive. One of the aims of the study was therefore to isolate the operational mechanisms involved in the formal reasoning process itself, when this reasoning rests on notions already constructed at the concrete level. The experimental apparatus consisted of a "kind of billiard game". Balls were launched with a tubular spring device that could be pivoted and aimed in various directions around a fixed point. The ball was shot against a projection wall (with a "rubber bumper") and rebounded to the interior of the apparatus. A target was placed successively at different points and subjects were asked simply to aim at it. Afterwards, they reported what they observed. Piaget reports that the equality between the angles of incidence and reflection is discovered only at Stage III-A (11-12 to 14 years) and is often not formulated until Stage III-B (14-15 years). Piaget's problem was to understand why a concept as familiar after 7-9 years as that of the equality of two angles is utilized in the induction of an elementary law only at this later date and especially, why formal operations are necessary for its use. Piaget concludes (p. 15) that the content of Stage III reactions is quite different from that of preceding Stages: reasoning by hypothesis and a need for demonstration replace the simple stating of relations. Thought proceeds from a combination of possibility, hypothesis and deductive reasoning, instead of being limited to deductions from the actual immediate situation. The distinction between
the one-one correspondence of the angles of incline (at Stage-II) and the reciprocity leading to the idea of the equality of angles (discovered at Stage III) involves the recognition that concrete operations consist of organized systems (classifications, serial ordering, correspondences etc.), they proceed from one partial link to the next in step-by-step fashion, without relating each partial link to all the others. Formal operations differ in that all of the possible combinations are considered in each case. Consequently, each partial link is grouped in relation to the whole; reasoning moves continually as a function of a "structured whole". The "discovery of the equality of the angles is the result of the reciprocal implication between the corresponding inclinations postulated from the start and not the inverse; this reciprocal implication differs from simple concrete correspondence by the fact that it results from a calculation of possibilities and not merely from an account of the empirical situation." Therefore, the criteria of assessment, with respect to the experiment focusing on angles of incidence and reflection involve the designation of Stage II-A, to subjects beginning to verbalize about angle relationships; Stage II-B, when demonstrating the ability to establish an ordering of slope relationships - "if this is sharper, that will be sharper"; when beginning to investigate the situation by making hypotheses, Stage III-A; and Stage III-B when an equal angle law is established which covers all cases.

The present investigation employed the Piagetian Questionnaire devised by Fisher (1962, 1971), which includes the Angles of Incidence and Reflection based on the experiments and questions used by Inhelder and Piaget (op.cit.). The presentation of the questions is preceded by a demonstration of the relevant phenomena: bouncing a ball against a wall from various angles and requesting the observation of the behaviour of the ball. The questions based on the demonstration are shown in the complete Questionnaire which is reproduced in the Appendices, together with details of the administration and demonstration. Accompanying diagrams to clarify the questioning are also included in the Questionnaire. A "concrete" question expected to be solved by a subject at the concrete stage of
development, requires the establishment of a correspondence between the slope of incidence at the path and the slope of the reflected path. A formal question requires the discovery of the law of the equality of the angle of incidence and the angle of reflections. Tisher has demonstrated a high percentage of agreement between the Questionnaire and interview classifications based on the Geneva "clinical" approach. A 77 percent agreement between questionnaire and interview classifications indicate that both techniques are measures of the same variable.

Tables 6.8.1, 6.8.2, 6.8.3, 6.8.4 summarize the percentage distribution of subjects in the Angles of Incidence and Reflection task, in each of a variety of matched groups, representing lower and higher levels of logical thinking, termed "Concrete" or "Formal" groups in relation to modes of moral judgement. The various matching criteria and "cut-off" points have been expounded in the introduction to this Section. It is observed in all the Tables that nearly all subjects categorized as demonstrating higher levels of logical thinking on the Questionnaire as a whole obtain the higher category of scores on the Angles task. Percentages for boys reach 100% on Table 6.8.1 and Table 6.8.4 and over 90% on the remaining tables. Percentages for girls are over 50% reaching 91% on Table 6.8.3. The percentage of boys in the "Concrete" group obtaining the higher category of scores on the Angles task is particularly high on Table 6.8.1, reaching 66%. Tables 6.8.2, 6.8.3, and 6.8.4 record percentages of 36, 56, and 30 respectively. Percentages for girls are considerably lower: 27, 25, 19 and 25 throughout the tables respectively. Some sex differences in response to this task are therefore evident, particularly revealing superior performance by boys on this particular task, when categorized within the lower levels of logical thinking for the Piagetian tasks as a whole.

An analysis of the protocols broadly confirms the Piagetian model of qualitative differences in development. Further probes were added to Tisher's Piagetian Questionnaire in the present investigation, requiring subjects to justify their "multiple-choice selection for each question by responding to a "Why do you think so?" probe, together with three "cognitive-conflict-producing items being integrated into the Questionnaire at various points.
These allowed information to be gained with respect to the thinking behind the choices made by the subjects, thereby allowing qualitative analysis to be made in addition to quantitative, and the Questionnaire in this investigation therefore followed even more closely the approaches of the Geneva School. Subjects classified at the "concrete" stages responded throughout the seven items of the test, with such justifications as "the same angle from the wall"; "because the angles from the wall are the same", "because of the angle which is the same as how it went on"; "angle of in and out are equal so is middle angle" or "the angle the ball is thrown at the wall is the same as the angle that it will come off the wall." Early formal "subjects showed signs of beginning to formulate a law in their own terms and investigating the situation by making hypotheses: "the angles from A-C add up to 50°, so the opposite angle must add to the same number"; "because the ball rebounds at the same angle as it hit the wall" or "if it is hit accurately, there should be no rebound at a different angle". Late formal subjects were able to formulate a law, for example: "as before, the < of incidence 50° EVB has to equal the < the ball bounces off at -50° AYA"; "because the < between the wall and path = 50°, < between new path and C=50-50 = 40°", 20° + 30° = 50° and the angle made with CY by EV must equal the angle made with CY by AY"; "so that the angle of incidence = angle of refraction". These qualitative responses do not appear to differ from the varying stage responses recorded by Inhelder and Piaget within a slightly differing experimental situation.

Experimental replications of this experiment are not apparent: the only traced study including the task of angles of incidence and reflection in the testing battery is by Graybill (1974). This is published in Dissertation Abstracts and full details are not available. Graybill was mainly concerned to investigate sex differences in the transition from concrete to formal thinking patterns and reports sex differences, in favour of boys for the four formal operations problems investigated. This reported finding would appear to indicate similar trends for sex differences with respect to the Angles task as those commented upon earlier in connection with the present investigation.
123 subjects from the total sample of 231 successfully completed all five concrete items and the two formal items for the Angles task. This percentage would seem to be considerably higher than for the remaining tasks and it is speculated, supported by some evidence from the additional information obtained from the schools, that this particular task had received treatment in a different form within the school curriculum. However, it has frequently been shown experimentally that teaching has little effect unless the relevant operational schema are developed and this is borne out on a number of protocols, where subjects have recorded on the back of their questionnaire that they have met a similar situation within their school syllabus, but have not successfully completed the items. Piaget and Inhelder and Piaget (op.cit., p.135) in similar vein comments, "acquired knowledge may intervene, but we still want to know how well the adolescent can understand and make use of this knowledge, so the problem of formal operations remains decisive here and the influence of school is no bar to our analysis."

Tables 6.8.1, 6.8.2, 6.8.3 and 6.8.4 further indicate the relation of logical thinking to moral stages, i.e., to the varying modes of moral judgement. It is observed that subjects categorized as demonstrating higher levels of logical thinking on the test as a whole display greater evidence of Stage 4 moral thinking than subjects categorized as being at the "concrete" level. Percentages for boys, are 29%, 42%, 32%, and 36% for girls, 36%, 37%, 38% and 22% for the "formal" group as compared with 21%, 12%, 20% and 12% for boys, 0%, 6%, 5% and 3% for girls on Tables 6.8.1, 6.8.2, 6.8.3 and 6.8.4 respectively.

There is evidence that greater numbers of subjects attain Stage 4 moral thinking with higher scores on the Angles task than those with lower scores on the task. The six percent of subjects displaying Stage 5 moral thinking are all high scorers on the Angles task. It is further apparent that no subjects categorized as "formal" on the Questionnaire as a whole show no evidence of Stage 2 moral thinking. "Concrete" subjects revealing Stage 2 moral thinking are apparent in higher percentages in the low scoring category on the Angles task than those scoring within the higher
category on the task. Therefore in all the Tables there is a trend between the attainment of higher scores on the Angles of Incidence and Reflection task and indications of Stage 4 moral thinking and inversely indications of Stage 2 moral thinking in association with lower levels of attainment on the Angles of Incidence and Reflection task. It can be speculated that as the subject moves nearer to the equilibrium of formal operations he is more logically capable of considering more possibilities. This ability to consider more alternatives and to evaluate them would assist the subject to take a more global view when faced with a moral dilemma. Due to greater mobility and flexibility of thought at the more advanced stage it can be suggested that feelings can become decenred from personal or material realities and become more adequate for dealing with social realities and even ideal realities. Lee (op.cit.) concluded that the concrete operation components of cognitive functioning is best related to authority type responses independent of age and to concomitant increase in reciprocity response in the moral mode of conceptualization. The formal operation component of cognitive functioning best predicts the increase of "societal" moral response,
TABLE 6.9.1. - EQUILIBRIUM IN THE BALANCE

The table summarizes the percentage distribution, on this test, of subjects in each matched group (N = 35 + 35 = 70) "Concrete" / "Formal" in relation to Fades of Moral Judgement

<table>
<thead>
<tr>
<th>Level of Operativity</th>
<th>Score</th>
<th>Boys 2(3); 3(2)</th>
<th>Stage 3; Stage 3(4); 4(3); 4; Stage 4(5); 5(4)</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower levels of logical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>thinking</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Concrete&quot;</td>
<td>Above</td>
<td>4</td>
<td>63</td>
<td>63</td>
<td>17</td>
<td>17</td>
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<td>5</td>
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<td>63</td>
<td>63</td>
<td>17</td>
<td>17</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Higher levels of logical     |       |                 |                                                 |      |       |      |       |      |       |      |       |
| thinking                     |       |                 |                                                 |      |       |      |       |      |       |      |       |
| "Formal"                     | Above | 63              | 45                                             | 17   | 27    |      |       |
|                              | 5     | 8               | 18                                             | 13   | 9     |      |       |
### Table 6.9.2: Equilibrium in the Balance

The Table summarizes the percentage distribution, on this test, of subjects in each matched group \( (N = 33 + 33 = 66) \) "Concrete" / "Formal" in relation to Modes of Moral Judgement.

<table>
<thead>
<tr>
<th>Level of Operativity</th>
<th>Moral Stages</th>
<th>Nodes of Moral Judgement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stages 2(3); 3(2)</td>
<td>Stage 3;</td>
</tr>
<tr>
<td><strong>Score</strong></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Lower levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of logical thinking</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>&quot;Concrete&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 and below</td>
<td>23</td>
<td>59</td>
</tr>
<tr>
<td>Higher levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of logical thinking</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>&quot;Formal&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table 6.9.3. - Equilibrium in the Balance

The table summarizes the percentage distribution, on this test, of subjects in each matched group (N = 46 + 46 = 92). "Concrete" / "Formal" in relation to Modes of Moral Judgment

<table>
<thead>
<tr>
<th>Level of Operativity</th>
<th>Moral Stages 2(3); 3(2);</th>
<th>Stage 3;</th>
<th>Stages 3(4); 4(3); 4;</th>
<th>Stages 4(5); 5(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Lower levels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of logical thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Concrete&quot; and below</td>
<td>16</td>
<td>14</td>
<td>56</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher levels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of logical thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Formal&quot; and below</td>
<td>8</td>
<td>10</td>
<td>4</td>
<td>10</td>
</tr>
</tbody>
</table>
**TABLE 6.9.4. - EQUILIBRIUM IN THE BALANCE**

The Table summarizes the percentage distribution, on this test, of subjects in each matched group ($n = 65 + 65 = 130$) "Concrete" / "Formal" in relation to Modes of Moral Judgement.

<table>
<thead>
<tr>
<th>Moral Stages - Modes of Moral Judgement</th>
<th>Stages 2(3); 3(2);</th>
<th>Stage 3;</th>
<th>Stages 3(4); 4(3); 4;</th>
<th>Stages 4(5); 5(4);</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Operativity</td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td><strong>Score</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower levels of logical thinking</td>
<td>Above</td>
<td></td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>&quot;Concrete&quot;</td>
<td>5</td>
<td>13</td>
<td>16</td>
<td>64</td>
</tr>
<tr>
<td>and below</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher levels Above</td>
<td>Above</td>
<td></td>
<td>5</td>
<td>39</td>
</tr>
<tr>
<td>of logical thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Formal&quot;</td>
<td>5</td>
<td>27</td>
<td>19</td>
<td>15</td>
</tr>
<tr>
<td>and below</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
According to Piaget and Inhelder (1969) the notion of proportion appears at eleven or twelve years in several different areas always in the same initially qualitative form. These areas are, among others, spatial proportional (similar figures), metrical speeds, \( S/T = NS/NT \), probabilities \( x/y = nx/ny \), relations between weights and lengths of the arms of a balance. Concerning the balance, the subject first by ordinal reasoning discovers that the greater the weight, the lower the arm and the farther from the line of equilibrium. This leads him to discover a linear function and to understand a first condition of equilibrium (the quality of weights at equal distances from the central point). Also by ordinal reasoning, he discovers that a single weight \( W \) pulls the arm down more the farther it is placed from the pivot. From this he also derives a linear function and understands that equilibrium is attained for two equal weights provided that they are equidistant from the pivot, however long the distance \( L \) may be. The discovery of the inverse proportionality between \( W + L \) is also obtained by a qualitative co-ordination of these two initially ordinal functions. Comprehension begins when the child discovers that the result stays the same if he increases a weight without changing the distance from the centre on the one side, while increasing the distance without changing the weight on the other. From this he derives the hypothesis (which he verifies in an ordinal manner) that when you begin with two equal weights at equal distances from the centre, you maintain equilibrium by decreasing one weight but moving it farther away or by increasing the other weight and moving it closer to the centre. It is only then that he grasps the simple metrical proportion \( W = 2W \), etc., but he discovers this by beginning with the qualitative proportion; that is, that decreasing the weight and increasing the length is equivalent to increasing the weight and decreasing the length. The scheme of proportionality is derived directly from the "four-group". The subject begins with two transformations, each of which involves an inverse: increasing (or decreasing the weight or the length (\( + W \) and \( + L \)).
Then he discovers that the inverse of one (decrease of weight, or -W) may be replaced by the inverse of the other (decrease of length, or -L) which is not identical to the first inverse but leads to the same result by compensation and not by cancellation. If +W is regarded as the basic operation (I) and -W as the inverse (N), then -L is the reciprocal (R) of +W and +L is its correlative (C). Since two pairs of direct and inverse transformations are involved, along with a relation of equivalence (but not of identity), the system of proportion must derive from the "4-group" and takes the form 1/R = C/N (or by crossed products LN - RC).

Inhelder and Piaget's experimental situation (1958, pp.164-161) involved the use of "a simple balance-type weighing instrument, a see-saw balance," with varying weights which could be hung at different points along the crossbar. Subjects at Stage II-A place the weights randomly in an attempt to attain balance. Weights are added and moved with no evidence of an underlying system, subjects usually finding an arrangement of weights that balance, but are not able to generalize. At Stage II-B subjects try to balance the apparatus by rudimentary logic (i.e. by moving the lighter weight further out, often formulating a general rule that the heavier weight must be nearer the middle and the lighter weight further out. A strategy is sometimes adopted such as 3 x 2 = 6 without understanding proportionality. The proportional relationship that exists between weight and distance is discovered at Stage III-A and at a number of examples which can be given for each situation explored. Indications are given in subjects explanations that one variable compensates for another, however there is still difficulty in transforming information and generalizing it to theoretical situations. It is only at Stage III-B that the proportional relationship which exists between distance and weight is quickly discovered, allowing generalization to theoretical situations and an adequate explanation of proportionality.

The present investigation employed the Piagetian Questionnaire devised by Tisher (1962, 1971) which includes the Equilibrium in the Balance Task based on the experiments and questions used by Inhelder and Piaget (op.cit.). The presentation of the questions is preceded
by a demonstration of the relevant phenomena—returning a balance arm to a state of equilibrium using weights placed at various distances along the arm. The questions based on the demonstration are shown in the complete Questionnaire which is reproduced in the Appendices together with details of the administration and demonstration. A diagram of the apparatus used for the demonstration is included in the Questionnaire. A "Concrete" question expected to be solved by a subject at the concrete stage of development, since a subject in this stage would realize that equal weights at equal distances from the fulcrum balance each other, involves ten units of weight being hung at the third position on the left arm and the subject being required to state which of the positions, first on the left arm, fourth, third, fifth on the right, together with the option impossible, another ten units of weight must be hung. A question to be solved by a subject in the formal stage of mental development, since it requires that the subject has discovered the proportional relationship between their weights and their distances from the fulcrum, involves ten units of weight being hung on the left arm and the requirement to cite the position for fifteen units of weight to be hung in order to balance the arm. Fisher has demonstrated a high percentage of agreement between the Questionnaire and interview classifications based on the Genovian "clinical" approach. A 74.7 percent agreement between questionnaire and interview classification indicates that both techniques are measures of the same variable.

Tables 6.9.1, 6.9.2, 6.9.3, 6.9.4 summarize the percentage distribution of subjects in the Equilibrium in the Balance task, in each of a variety of matched groups, representing lower and higher levels of logical thinking, termed "Concrete" or "Formal" groups in relation to modes of moral judgement. The various matching criteria and "cut-off" points have been expounded in the introduction to this section. It will be observed in Table 6.9.1 that 80 percent of the boys and 72 percent of the girls in the group demonstrating higher levels of logical thinking ability on the Piagetian tests as a whole, achieve the higher category of scores on the test of Equilibrium in the Balance. Only 8 percent of the boys and 18 percent of the girls in the group demonstrating lower levels of logical thinking
ability on the Piagetian tests as a whole, achieve the higher
category of scores on the test of Equilibrium in the Balance.
Table 6.9.2, 6.9.3, representing groups formed by differing
matching criteria show similar trends. However, in the largest
criterion group (Table 6.9.4) representing higher levels of logical
thinking ability on the Piagetian tests as a whole, it is observed
that the percentage of boys obtaining the higher score category on
this test is considerably lower, with the percentage for girls
remaining similar to other criterion groups. There are no signific-
ient sex differences although a slight trend in favour of boys with
respect to the obtaining of higher scores on this test.

An analysis of the protocols broadly confirms the Piagetian
model of qualitative differences in development. Further probes were
added to Tisher's Piagetian Questionnaire in the present investigation
requiring subjects to justify their "multiple choice" selection for
each question by responding to a "why do you think so?" probe,
together with three "cognitive-conflict" - producing items being
integrated into the Questionnaire at various points. These allowed
information to be gained with respect to the thinking behind the
choices made by the subjects thereby allowing qualitative analysis
to be made in addition to quantitative and the Questionnaire in this
investigation therefore followed even more closely the approaches of
the Geneva school. Subjects classified at the "concrete" stages
responded throughout the seven items of the test, with such justifi-
cations as "... because the distance from the pivot is equal...",
because to balance it the weight must be put on the corresponding
peg on the other side", deteriorating to "just a good guess",
"... it balances out this way in theory", "... hoping the distance
is enough to swing the odds", "... to balance it out and make it more
stable." "Concrete" subjects sometimes gave indication of adopting
strategies involving the calculation of figures such as response to
item five: "Side A=40 and side B must be 40, but 51b x 8 = 40 and
there is no 8." It was evident from further writing on this
particular protocol that the positions on the arm had been ordered in
the reverse direction, i.e., 5, 4, 3, 2, 1, from the fulcrum. There
was therefore evidence of the realization of the proportional relation
showing emergence but unable to be fully developed and applied.
Subjects categorized in the "early formal" stages of development offered explanations, for example with respect to item six: "\(10 \times 2 + 5 \times 4 = 40 = 10 \times 4 = 10 \text{ lbs at J or in response to item four the weights and forces of both sides must equal}\)
\[10 \times 3 = 15 \times 2 = 20,\] therefore the weight must be hung at H."

One of the nine subjects in the total sample categorized as "late formal" on the basis of the Questionnaire as a whole justified her response to item six as follows: "\(10 \times 2 + 5 \times 4 = d \times w, 40 = d \times w, d = 4 \ w = 10, \) therefore a ten pound weight must be hung at J."

Lovell's (1961) finding that few subjects could verbalize the operative principles governing the situation was borne out in this investigation. He found few subjects who could verbalize the rules. Lee (1971) reports that the verbalization of the operating principles was attained by less than 50 percent of the subjects even at age 17 years. An analysis of the protocols in the present investigation adds further credence to Lovell's comment that despite the majority of protocols showing much of the same kind of reasoning as those of Inhelder and Piaget (op.cit.) and supporting many of their statements, no subject replied like Inhelder and Piaget's "Sam" (1958, pp.174-176) who commented, "If you want to calculate, its best to consider it (distance) horizontally, if you want to understand it, vertically is better." Lovell elaborates, "In other words we did not find anyone who understood that force and height compensate one another, so that the work done is the same in both instances, as did the author's subjects at Stage III-B." Jackson (1963) likewise focuses on the necessity for more critical examination of children's comments and test behaviour.

Lovell further reports that the least able children remain at a low level of logical thought even at 15 years of age and many of these do not seem to pass beyond the IIIA-IIIB stage of thinking. As Lovell comments this is a finding not mentioned by Inhelder and Piaget and "it leads me to suspect that the school population in Geneva which they examined consisted of able children." As has been indicated earlier only nine subjects from 231 aged 14 to 15 years in the present investigation could be classified at "Late Formal" and only 3 subjects
from the total sample successfully completed all the 3 concrete and 4 formal items for the test of Equilibrium in the Balance. 35 subjects from the total sample successfully completed 3 concrete and 3 formal items from the total of 3 concrete and 4 formal items for this test (34 subjects: 3 concrete and 2 formal items). Jackson (op.cit.) reports that among children with IQ's between 90 to 110 comprising four boys and four girls in each of the age groups 5, 7, 9, 11, 13 and 15 the following stages in the Equilibrium in the Balance situation were derived: 1-A 1; 1-B 13; 2-A 8; 2-B 19; 3-A 6; and 3-B 1. However, although the ages of the children categorized at the various stages are not given, it can be speculated from the derivable facts that from the 16 children aged 13 and 15, 7 can be categorized as being at the formal stage (1 being at late formal). This may be considered to be a higher percentage that in the present investigation.

Ross (1973) among 65 undergraduates determined the following frequency and percentage of subjects at each substage for the Balance task:

<table>
<thead>
<tr>
<th>Concrete 1</th>
<th>Concrete 2</th>
<th>Formal 1</th>
<th>Formal 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>17</td>
<td>33</td>
<td>11</td>
</tr>
<tr>
<td>6.2%</td>
<td>26.2%</td>
<td>50.8%</td>
<td>16.9%</td>
</tr>
</tbody>
</table>

Ross considers that his data agrees with Tomlinson-Keesey's (1972) findings that a college-educated sample has significantly more than 50% of the subjects functioning at the formal level. On three of the four formal tasks investigated, the percentages approached or were greater than the 75% norm used by Piaget (cited in Elkind, 1961a) to indicate that an age group had reached a particular stage of development. Past research has shown that younger and more typical adolescent samples usually have 50% or less of the sample operating at the formal level. Such results have led Piaget (1972) to admit that the original normed sample might have been drawn from a "privileged population from the better Genova Schools." In the same paper, Piaget theorizes that due to varying social environments the development of the formal operations may be delayed until 15-20, rather than the originally stated 11-15 period.
Tables 6.9.1, 6.9.2, 6.9.3, 6.9.4, further indicate the relation of the logical thinking to moral stages, i.e. to the varying modes of moral judgement. It will be observed that in the Tables the groups representing subjects displaying higher levels of logical thinking on the Piagetian tests as a whole and obtaining higher scores on the equilibrium in balance task, further display in greater percentages than subjects scoring low in the balance task, evidence of Stage-4 thinking on the moral dimensions. However in the groups representing the lower levels of logical thinking in the Piagetian test as a whole, more subjects scoring lower on the Balance task display evidence of moral Stage-4 thinking than the few subjects in each of the groups scoring at higher levels on the Balance task. A significant trend in however confirmed from all four Tables: no subjects in the groups displaying higher levels of logical thinking on the test as a whole indicate any percentage of Stage-2 moral thinking whereas the groups displaying lower levels of logical thinking on the complete Piagetian test show indications of Stage-2 moral thinking. It is interesting to record that with the exception of Table 6.9.4 (where only 3 percent of girls deviate), all subjects in the lower levels of logical thinking groups indicating some Stage-2 moral thinking reveal the lower range scores on the Equilibrium in the Balance task. Only subjects in the "formal" group display any elements of Stage-5 moral thinking and scores on the Balance task do not indicate a clear relationship. Therefore in all the tables there is a trend between the attainment of higher scores on the Balance task and indications of Stage-4 moral thinking and inversely indications of Stage-2 moral thinking in association with lower levels of attainment on the Balance task. It can be speculated that as the subject moves nearer to the equilibrium of formal operations he is more logically capable of considering more possibilities. This ability to consider more alternatives and to evaluate them would assist the subject to take a more global view when faced with a moral dilemma. Due to greater mobility and flexibility of thought at the more advanced stage it can be suggested that feelings can become decentred from persons or material realities and become more adequate for dealing with social realities and even ideal realities.
Lee (op.cit.) concluded that the concrete operation component of
cognitive functioning is best related to authority type responses
independent of age and to concomitant increases in reciprocity
response in the moral code of conceptualization. The formal
operations component of cognitive functioning best predicts the
increase of "societal" moral responses.
### TABLE 6.10.1 - COMMUNICATING VESSELS

The Table summarizes the percentage distribution, on this test, of subjects in each matched group ($N = 35 + 35 = 70$) "Concrete" / "Formal" in relation to Modes of Moral Judgement.

<table>
<thead>
<tr>
<th>Level of Operativity</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Lower levels of logical thinking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Concrete&quot;</td>
<td>4</td>
<td>13</td>
<td>18</td>
<td>67</td>
<td>72</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>and below</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher levels of logical thinking</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Formal&quot;</td>
<td>4</td>
<td>58</td>
<td>63</td>
<td>29</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>and below</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 6.10.2 - COMMUNICATING VESSELS

The table summarizes the percentage distribution, on this test, of subjects in each matched group (N = 33 + 33 = 66). "Concrete" / "Formal" in relation to Modes of Moral Judgement.

<table>
<thead>
<tr>
<th>Moral Stages</th>
<th>Modes of Moral Judgement</th>
<th>Stages 2(3); 3(2);</th>
<th>Stage 3;</th>
<th>Stages 3(4); 4(3); 4;</th>
<th>Stages 4(5); 5(4);</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Operativity</td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
</tr>
<tr>
<td>Score Above</td>
<td>4</td>
<td></td>
<td>23</td>
<td></td>
<td>65</td>
</tr>
<tr>
<td>Lower levels</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of logical thinking</td>
<td>&quot;Concrete&quot;</td>
<td></td>
<td>&quot;Concrete&quot;</td>
<td></td>
<td>&quot;Concrete&quot;</td>
</tr>
<tr>
<td>and below</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher levels</td>
<td>4</td>
<td></td>
<td>12</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>of logical thinking</td>
<td>&quot;Formal&quot;</td>
<td></td>
<td>&quot;Formal&quot;</td>
<td></td>
<td>&quot;Formal&quot;</td>
</tr>
<tr>
<td>and below</td>
<td>4</td>
<td></td>
<td>47</td>
<td>63</td>
<td>29</td>
</tr>
</tbody>
</table>
### Table - 6.10.3 - Communicating Vessels

The table summarizes the percentage distribution on this test of subjects in each matched group \((N = 46 + 46 = 92)\) "Concrete" / "Formal" in relation to Modes of Moral Judgement.

#### Moral Stages — Modes of Moral Judgement

<table>
<thead>
<tr>
<th>Level of Operativity</th>
<th>Stages 2(3); 3(2);</th>
<th>Stage 3;</th>
<th>Stages 3(4); 4(3); 4;</th>
<th>Stages 4(5); 5(4);</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Lower levels of logical thinking</td>
<td>Score Above</td>
<td>4</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>&quot;Concrete&quot; and below</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Highest levels of logical thinking</td>
<td>Score Above</td>
<td>4</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>&quot;Formal&quot; and below</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of Operativity</td>
<td>Score</td>
<td>Stage 2(3); 3(2);</td>
<td>Stage 3;</td>
<td>Stages 3(4); 4(3); 4; Stages 4(5); 5(4)</td>
</tr>
<tr>
<td>----------------------</td>
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<td>-------------------</td>
<td>---------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Lower levels</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>of logical thinking</td>
<td>Above</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Concrete&quot;</td>
<td>4</td>
<td>18</td>
<td>19</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>4 and below</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher levels</td>
<td>Above</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of logical thinking</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Formal&quot;</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>4 and below</td>
<td>58</td>
<td>66</td>
<td>24</td>
</tr>
</tbody>
</table>
The experiment involving Communicating Vessels is a problem of equilibrium. Inhelder and Piaget (1958, p.135) elaborate that in every equilibrium the two possible forms of reversibility operate simultaneously: inversion, which corresponds to the additions or eliminations effected in the parts of the system which come into equilibrium and reciprocity, which corresponds to the symmetries or compensations between these parts (thus to actions which are both equivalent as regards their respective products and oriented in opposite directions). Inversions and reciprocities are part of the Group of Four transformations which are at the centre of the mechanisms of formal thought. This group is of psychological importance because it corresponds to certain fundamental structures of thought, for inversion expresses negation, reciprocity expresses symmetry (equivalent transformations oriented in opposite directions), and correlativity is symmetric with negation. This explains why the notion of equilibrium, which at a very early age rises to certain rough intuitions (balance, etc.), is not really understood before the formal level, when the subject can both distinguish and co-ordinate inversions, reciprocities and correlativities (inversion's: for example, increase or diminish a force in one of the parts of the system; reciprocities: compensate for a force by an equivalent force, thus assuring symmetry between the parts; correlativities: reciprocity in negation). Although they may be relatively simple in certain concrete cases, these transformations actually require thinking and statements of a very abstract sort in most problems involving action and reaction, for the difficulty lies in grasping that X is at the same time equal to Y and acting in the opposite direction from it. It is then that it is necessary to go beyond propositional logic to include its fundamental group/INRC. In the case of vessels, reciprocity serves to express the compensatory actions between separate vessels; transformations by inversion express the rise and fall of the water level. Changes in water level are
brought about not by adding or taking away water, but by raising or lowering the receptacles. In Inhelder and Piaget's experiment, apparatus A allowed the subject to raise or lower the vessels by hand, by adding or taking away the stand on which they rested; in apparatus B the two vessels could be raised or lowered with levers and apparatus C allowed the movement of only one of the vessels, the other being stationary. Since the receptacles had neither the same shape nor the same volume, it was necessary to exclude these two factors to find the law. However, Piaget emphasizes that air pressure can be disregarded, for it was equivalent for the two columns of liquid. Piaget provides a footnote (ibid p.135) setting out the formula to illustrate the lack of difference in density between the contents of the two vessels. At Stage 11-A the subjects are able to raise and lower the containers with a view toward raising or lowering the water level: a preliminary inversion (raising and lowering) and reciprocity (the water goes down in one vessel as it rises in the other) were present, but lacking, was the condition of equivalence, which alone would allow the subject to co-ordinate these transformations - the final equality of the two water levels. Stage 11-B subjects discover both the equality of water levels and the means of verifying this equality once a reference system based on the co-ordinates of immediate physical space (vertical and horizontal) is established. Verification is effected either by checking whether the line uniting the two surfaces is horizontal or by measuring their respective heights. The concrete operations available to the subject at this stage do not however allow him to discover the nature of the mechanism of these transformations although by their temporal and spatial serial ordering and correspondence they allow him to determine the conditions of equilibrium. At the first formal level, 111-A, in contrast, an important reworking of the operations and the explanation is observed. Equilibrium in communicating vessels is no longer conceived of as the simple flow of water from a higher level to a lower one until equality of levels is achieved, but as a system of actions and reactions whose inversions and reciprocities are stated in mechanical and not merely in spatiotemporal terms. Subjects require equality of weight based on equal volumes before they are willing to talk about equality of
levels, and deny that two vessels of unequal capacity can verify the law. They fail to understand the compensation resulting from the relationship between the weight of the vertical column of water and the surface area of the base of this column. They outline an interpretation based on compensation, on the fact that each of the two quantities of liquid exerts a pressure on the other, the two pressures being, by this very fact, oriented in opposite directions, but the subject does not know how to generalize it to the case of unequal quantities. Piaget suggests that the reactions of Stage III-B subjects are "influenced by academic knowledge (which, moreover, has been assimilated only to the extent that it fits into the schema whose development we have just noted)." Finally, at Stage III-A, "the spontaneous schema of explanation outlined during III-A is filled in with information gained through education; thus the contradiction between the equality of water levels and the eventual inequalities of the amounts of liquid is eliminated. But one can easily see that this contribution from without does not modify the structure of the reasoning." Having a more or less clear understanding of the fact that the pressure of the liquid is relative to the surface area of the vertical column at its base, the subject explains the phenomenon of communicating vessels in a fashion analogous to that used at Stage III-A, but generalizes to the case of unequal quantities. The essential point in the explanation is that even in the case of unequal volumes the pressures compensate each other in function of the height of the column "so equilibrium is reached."

The present investigation employed the Piagetian Questionnaire devised by Tisher (1962, 1971) which includes the Communicating Vessels based on the experiments and questions used by Inhelder and Piaget (ibid). The presentation of the questions is preceded by a demonstration of the relevant phenomena - involving varying the water level in the connected water containers. The questions based on the demonstration are shown in the complete questionnaire which is reproduced in the Appendices, together with details of the administration and demonstration. A diagram of the apparatus used for the demonstration A diagram of the apparatus used for the demonstration is included in
the Questionnaire. A "Concrete" question expected to be solved by a subject at the concrete stage of development, since a subject in this stage would discover that the water levels in both containers return to a common horizontal level after one or both of the containers were raised or lowered involves stating what would happen when containers A or B are moved up or down. A question to be solved by a subject in the formal stage of mental development since it requires the correct explanation for the observed equality of the levels and the prediction of what would happen to the water level in one of the containers, A, if A or the other container were raised or lowered, involves stating the cause of the level of the water in the container A being observed to rise. Tisher has demonstrated a high percentage of agreement between the Questionnaire and interview classifications based on the Genevan "clinical" approach. A 747 percent agreement between Questionnaire and interview classification indicates that both techniques are measures of the same variable.

Tables 6.0.1, 6.0.2, 6.0.3, 6.0.4, summarize the percentage distribution of subjects in the Communicating Vessels task in each of a variety of matched groups, representing lower and higher levels of logical thinking, termed "Concrete" or "Formal" groups in relation to modes of moral thinking. The various matching criteria and "cut-off" points have been expounded in the introduction to this section. It is observed that only low percentages of even subjects demonstrating higher levels of logical thinking on the basis of the Questionnaire as a whole, were able to successfully solve the one formal problem in this particular task. The percentages for boys are 15%, 24%, 32%, and 16% for girls, 9%, 6%, 10%, and 12% on Tables 6.0.1, 6.0.2, 6.0.3 and 6.0.4, respectively. For subjects demonstrating lower levels of logical thinking on the basis of the test as a whole no boys are able to successfully complete the formal question and only 9%, 13%, 10% and 3% of girls on the four Tables respectively.

An analysis of the scores for the total sample of 231, reveals that only 13 subjects successfully completed the four concrete questions and the one formal question. However, a further 7 subjects failing to successfully complete one of the four concrete questions,
were able to respond to the formal item. Only 19 subjects from
the total sample solved all four concrete items and it is apparent
that the majority of these were the subjects completing the formal
item. 39 subjects solved three of the concrete questions and 52
subjects two concrete items. It is therefore suggested that this
particular task proved to be the most difficult task for the
majority of the subjects. It is unfortunate that there is little
evidence of replications studies. The only study traced which
included the Communicating Vessels in its battery of tasks, is that
of Jackson (1963). He reports the following numbers of subjects
reaching each sub-stage among four boys and four girls in each of the
each age groups, 5, 7, 9, 11, 13 and 15 as follows:

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>1B</td>
<td>2A</td>
<td>2B</td>
<td>3A</td>
</tr>
<tr>
<td>0</td>
<td>9</td>
<td>22</td>
<td>12</td>
<td>4</td>
</tr>
</tbody>
</table>

On the basis that there were 16 subjects aged 13-15 years there
is the indication that numbers achieving the formal operational levels
were low, although it appears, not as low as in the present investiga-
tion. Subjects in the present investigation indicated on the
reverse of their Questionnaire sheets, that they had not met a
similar situation in their school curriculum and attention may be
drawn to Piaget's comment concerning the reactions of Stage III-B
subjects being "influenced by academic knowledge," as a tentative
attempt to explain the particularly low level of response on this
particular test.

However, an analysis of the protocols broadly confirms support for the
Piagetian model of qualitative differences in development. Further
probes were added to Tisher's Piagetian Questionnaire in the present
investigation requiring subjects to justify their multiple choice
selection for each question by responding to a "Why do you think so?"
probe, together with three "cognitive-conflict" - producing items
being integrated into the Questionnaire at various points. These
allowed information to be gained with respect to the thinking behind
the choices made by the subjects, thereby allowing qualitative
analysis to be made in addition to quantitative and the Questionnaire
in this investigation therefore followed even more closely the approaches of the Concrete School. Subjects classified at the concrete stage responded with such justifications as "because they must level out"; "because it is a known fact that whatever water always seeks its own level"; "because the water will go out of container B and into container A"; "equal movement"; "because when moving (both) the containers the water level will always stay the same" or "because the amount of water lost in A will be gained by B". Subjects categorized in the "early formal" stages of development offered explanations characteristic of the responses described by Piaget; "because the pressure in each container would have to be equal and so the higher level drops slightly and the other rises slightly until both levels are equal"; "because the decrease equals the increase"; "in order to equal the gravitational pull" or "because of the pressure of the air." Subjects classified as "late formal" on the test as a whole and successfully completing the formal question showed lack of ability in verbalizing their justification and still tended to respond in terms more characteristic of the early formal stage; "because the pressure on the surface of liquid in container A will be equal to pressure on the corresponding point in container B" or "the pressure in container B changes and the water level drops to bring both pressures equal." Again focus can be placed on Piaget's reflections concerning "influence by academic knowledge" and "the spontaneous schema of explanation" being "filled in with information gained through education" as explanation for this particularly poor response on this test.

Tables 6.0.1, 6.0.2, 6.0.3, 6.0.4, further indicate the relation of logical thinking for moral stages - i.e. for the varying modes of moral judgement. It is observed from the Tables that all subjects displaying Stage-2 moral thinking are those also scoring in the lower ranges of scores on the Communicating Vessels task. It is further observed that subjects categorized as "formal" on the basis of the Questionnaire as a whole display no Stage-2 moral reasoning. Only subjects in the "formal" group display evidence of Stage-5 moral thinking. It is apparent that there is not a significant relationship between success on the one formal question for the Communicating Vessels
task and Stage-4 moral thinking, for among the "formal" group the percentages of boys displaying Stage-4 thinking but not solving the formal item on this particular test are: 29, 29, 24, and 24 and percentages of girls: 27, 31, 33, and 19 for the "formal" group on Tables 6.0.1, 6.0.2, 6.0.3, 6.0.4, respectively. For the "Concrete" group the percentages are lower for boys and considerably lower for girls. There is however a trend with respect to the relationship between level of logical thinking and stages of moral thought and it can be speculated that as the subject moves nearer to the equilibrium of formal operations he is more logically capable of considering more possibilities. This ability to consider more alternatives and to evaluate them would assist the subject to take a more global view when faced with a moral dilemma. Due to greater mobility and flexibility of thought at the more advanced stage it can be suggested that feelings can become decoupled from persons or material realities and become more adequate for dealing with social realities and even ideal realities. Lés (op.cit.) concluded that the concrete operation component of cognitive functioning is best related to authority type responses independent of age and to concomitant increase in reciprocity response in the moral mode of conceptualization. The formal operations component of cognitive functioning best predicts the increase of "societal" moral responses.
TABLE - 6.U.I. - THE PROJECTION OF SHADOWS

The Table summarizes the percentage distribution, on this test, of subjects in each matched group (N = 35 + 35 = 70) "Concrete" / "Formal" in relation to Modes of Moral Judgement

<table>
<thead>
<tr>
<th>Level of Operativity</th>
<th>Stages 2(3); 3(2); Stage 3; Stages 3(4); 4(3); 4; Stages 4(5); 5(4)</th>
<th>Boys</th>
<th>Girls</th>
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<th>Boys</th>
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<td></td>
<td>4 and below</td>
<td>13</td>
<td>9</td>
<td>63</td>
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<td>20</td>
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<tr>
<td>thinking &quot;Formal&quot;</td>
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<td>4 and below</td>
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<td>9</td>
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</tr>
</tbody>
</table>
TABLE - 6.4.2. - THE PROJECTION OF SHADOWS

The Table summarizes the percentage distribution, on this test, of subjects in each matched group (N = 33 + 33 = 66) "Concrete / "Formal" in relation to Modes of Moral Judgement.

<table>
<thead>
<tr>
<th>Level of Operativity</th>
<th>Lower levels of logical thinking</th>
<th>Stage 3;</th>
<th>Stages 3(4); 4(3); 4;</th>
<th>Stages 4(5); 5(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Score</td>
<td>Boys</td>
<td>Girls</td>
<td>Boys</td>
</tr>
<tr>
<td></td>
<td>Above</td>
<td></td>
<td>37</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Concrete&quot;</td>
<td>4 and below</td>
<td>23</td>
<td>65</td>
<td>56</td>
</tr>
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<td>Higher levels of logical thinking</td>
<td>Above</td>
<td></td>
<td>41</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Formal&quot;</td>
<td>4 and below</td>
<td>18</td>
<td>19</td>
<td>29</td>
</tr>
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</tbody>
</table>
## TABLE 6.4.5 - THE PROJECTION OF SHADOWS

The Table summarizes the percentage distribution, on this test, of subjects in each matched group \((N = 46 + 46 = 92)\). "Concrete"/"Formal" in relation to Modes of Moral Judgement.

<table>
<thead>
<tr>
<th>Level of Operativity</th>
<th>Moral Stages (Stage 2(3); 3(2); Stage 3; Stages 3(4); 4(3); 4; Stages 4(5); 5(4))</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
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</thead>
<tbody>
<tr>
<td>Score</td>
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<td>Lower levels of logical thinking</td>
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<td>&quot;Concrete&quot;</td>
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<td></td>
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<td>16</td>
<td></td>
<td>5</td>
<td></td>
<td>64</td>
<td>57</td>
<td>20</td>
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<td>Higher levels of logical thinking</td>
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<td>&quot;Formal&quot;</td>
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<td>Above 4</td>
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<td>14</td>
<td>16</td>
<td>10</td>
<td></td>
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</tr>
</tbody>
</table>
The Table summarizes the percentage distribution, on this test, of subjects in each matched group \( (n = 65 + 65 = 130) \) "Concrete" / "Formal" in relation to Modes of Moral Judgement

<table>
<thead>
<tr>
<th>Moral Stages</th>
<th>Modes of Moral Judgement</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stages 2(3); 3(2)</td>
<td>Stage 3</td>
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<td>Score</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Lower levels of logical thinking</td>
<td>Above</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Concrete&quot;</td>
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<td>4</td>
<td>3</td>
<td>6</td>
<td>22</td>
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<td>&quot;Formal&quot;</td>
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<td></td>
<td></td>
<td>4</td>
<td>15</td>
<td>13</td>
<td>64</td>
<td>56</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher levels of logical thinking</td>
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<td>45</td>
<td>56</td>
<td>21</td>
<td>19</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>
THE PROJECTION OF SHADOWS

The operations involved in understanding proportionality are further described by Piaget (Inhelder and Piaget, 1958, pp.199-209) in an experiment in which the Shadows of a number of circular rings of different sizes (5, 10, 15, 20 cm. in diameter) were cast by a point of light onto a screen; the problem set to each subject was to make the shadows coincide, firstly with two rings and, subsequently with more—increasing to five or six. If it is supposed that a child has arranged one ring to cast a shadow on the screen and in deciding what to do with a different one; he may argue that if the shadow of the second ring is too big it can be reduced by moving the ring further from the light; if it is too small it can be enlarged by moving the ring nearer the light; alternatively, if the shadow is too big it could be replaced by a smaller one or, if too small by a longer one. The subject thereby takes into account four possible actions and since he represents them mentally, has considered four operations. At the level of formal operations, he does not make any adjustments by trial and error, but proceeds by measurement with calculation of proportions. The groups of four operations referred to in the discussion of Test 2 occur in all problems of proportionality as well as in other related problems. Proportionality is central to the Shadows experiment. The numerator and denominator in a ratio (i.e. a proportion) bear a reciprocal relation to one another (one can compensate for increase in one by increase in the other). Reciprocity is a characteristic acquisition of the formal stage. Comparing two ratios (which is fundamental in using ratios for problem solving) amounts to setting up a relation between relations. Insofar as the concrete stage tends to be restricted to thinking about “things” it would be expected that operations involving a “relation between relations” would have to await the formal stage.

The present investigation employed the Piagetian Questionnaire devised by Tisher (1962, 1971) which includes the Projection of Shadows Task based on the experiments and questions used by Inhelder and Piaget (1958). The presentation of the questions is preceded by
a demonstration of the relevant phenomena with three rings of
different diameters being placed at different distances from a
source of light and their shadows allowed to fall on to a screen.
The subjects observe the shadows as the distance of each object
from the light source is raised. The questions based on the
demonstration are shown in the complete questionnaire which is
reproduced in the Appendices, together with details of the
administration and demonstration. A diagram of the apparatus used
for the demonstration is included in the Questionnaire. A "concrete"
question expected to be solved by a subject at the concrete stage of
development, requires the discovery that the size of the shadow
depends on the size and distance of the object from the screen; no
inverse metrical relationship between size and distance would be
involved. A "formal" question requires the necessity of the dis­
covery of the universal metrical relationship between the size of the
object and its distance from the screen. Fisher has demonstrated a
high percentage of agreement between the Questionnaire and interview
classifications based on the Genevan "clinical" approach. A 74.7
percent agreement between the questionnaire and interview classi­
fication indicates that both techniques are measures of the same
variable.

Tables 6.11.1, 6.11.2, 6.11.3, and 6.11.4, summarize the percentage
distribution of subjects in the Projection of Shadows Task, in each
of a variety of matched groups, representing lower and higher levels
of logical thinking termed "Concrete" and "Formal" groups in relation
to modes of moral judgement. The various matching criteria and
"cut-off" points have been expounded in the introduction to this
section. It is observed that subjects categorized on the Piagetian
measure as a whole as demonstrating higher levels of logical
thinking consistently obtain the higher category of scores on the
Projection of Shadows test. Of particular interest is the significant
sex difference on this test; of the subjects obtaining the higher
category of scores, the higher percentages are represented by girls.
This is particularly focused in the groups representing subjects
categorized on the Piagetian measure as a whole as demonstrating
lower levels of logical thinking where 27 percent, 43 percent,
39 percent, and 31 percent respectively (Tables 6.4.1, 6.4.2, 6.4.3,
and 6.4.4) of girls obtain higher scores on the test of Projection
of Shadows as compared with 4 percent, 0 percent, 0 percent and
9 percent of boys, respectively.

An analysis of the protocols broadly confirms the Piagetian
model of qualitative differences in development. Further probes were
added to Tisher's Piagetian Questionnaire in the present investigation
requiring subjects to justify their "multiple-choice" selection for
each question by responding to a "why do you think so?" probe,
together with the "cognitive-conflict" producing items being integrated
into the Questionnaire at various points. These permitted information
to be gained with respect to the thinking behind the choices made by
the subjects, thereby allowing qualitative analysis to be made in
addition to quantitative and the Questionnaire, therefore followed
even more closely the approaches of the Geneva School. Subjects classified
as "concrete" still tended to focus on aspects such as "because
this is the way the light is aimed", "the dimness of the light", and
"prominent and fading light." They offered explanations, for example,
"the further away the ring is the larger it becomes, but is more than
double C", "they are right because I think they'd be equal being at
different distances from the screen", "the shadows will be equal as
the smaller is further throwing a larger shadow", or "Yes, because
C is further, the ring is larger." Subjects classified as "Early
Formal" justified their choices in terms, "due to proportions of ring
size and distance of shadow", "Yes, they could be right as it is
distance divided by size", or "difference in size but counteracted
by difference in length". "Late Formal" subjects supported their
responses with formulae: "as the ratios are the same, 1/4 = 3/12,"
"C Cl A" for item 3; \(\frac{\text{distance}}{\text{size}} = \frac{4}{1} : \frac{12}{3}\) for item 3 and for item
4, \(\frac{8}{2} = \frac{4}{1}\) "Late Formal" subjects were also able to justify the last
item in the following terms: \(\frac{8}{3} = X \cdot \frac{16}{2} = 3X\), \(\therefore X = 5\frac{1}{3}\)."

The "cognitive-conflict" probe tended to be supported by subjects able
to solve the problem correctly or rejected by those reaching an incorrect solution. "Late Formal" subjects responded to the "cognitive-conflict" item by setting out the formula and emphasized that an actual experiment would be needed to prove it so together with the necessity for exact measurements and exact sizes. Although it has been possible to cite examples of the responses of "late formal" subjects it is necessary to record that only 9 subjects from the total of 231, were able to successfully complete all the items on the Projection of Shadows test - 7 of the subjects being girls. 76 subjects from the total sample successfully completed 2 concrete and 2 formal items from the possible total of 2 concrete and 3 formal. Therefore the qualitative differences described by Inhelder and Piaget involving the increase of the ability to consider both distance and size simultaneously in order to solve the problem have been confirmed in this study. Lee (1971) has also substantiated the qualitative differences among subjects of 5 through 17 years. She comments with respect to the few subjects (less than 50% of subjects even at age 17) who could verbalize the operative principles governing the solution to the problem, previously commented on by Lovell (1961). The present investigation substantiates these observations.

Lovell (op.cit.) reports that out of a total of 24 least able comprehensive school pupils of varying ages, no subjects reached formal operational thought and from a group of 26 "oblect" subjects only three subjects reached formal thinking in the test of the Projection of Shadows. Duit (1972) reports the following findings for the Projection of Shadows Experiment:
Percentages of subjects functioning at the fully formal level on the Shadows experiment were younger adolescents 0%; older adolescents 35%; older gifted adolescents 57%; and average adults 33%. For boys in the group of gifted adolescents the percentage of fully formal was 75% the highest percentage in the investigation. When "relaxed" criteria were introduced, i.e. including the "almost formal" subjects with fully formal subjects, no significant change in the broad outline of the results was apparent, there being only a modest rise of only some of the percentages. Dulit reports that boys functioned at the fully formal level significantly more frequently than did girls. For the three older groups (where the numbers seem large enough to support the generalization), the percentages for boys were from two to four times as great as those for girls (Dulit is also referring to the Liquide experiment in these findings.) Trends in the present investigation tend to favour girls. Dulit is unable to offer an explanation for the reported sex differences except that the finding is consistent with similar sex differences noted in virtually all studies of abstract thinking. Tisher (1971) reports no sex differences in his investigation as a whole.

Tables 6.4.1, 6.4.2, 6.4.3, and 6.4.4 further indicate the relation of the performance on the Projection of Shadows task to moral stages, i.e., to varying modes of moral judgement. It will be
observed that higher percentages of subjects scoring in the upper
category of scores on the Projection of Shadows task in the groups
representing higher levels of thinking on the Questionnaire as a
whole, reveal Stage-4 moral thinking. However, in the "concrete"
groups there is a tendency for small percentages of Stage-4 moral
thinking to be present when scores on the Projection of Shadows test
are in the lower category. These percentages however tend to be
small. It is observed that no subjects categorized as "formal" on
the Piagetian tests as a whole reveal Stage-2 moral thinking. Of
further interest is the indication from Table 6.4 that of the 6%
of subjects indicating Stage-5 moral thinking, all are in the
"Formal" Group and all have obtained the higher category of scores
on the "Shadows" task. Further, in the groups representing lower
levels of logical thinking there are higher incidences of lower
scores on the Shadows task in relation to Stage-2 moral thinking.
Therefore in all the Tables there is a trend between the attainment
of higher scores on the Shadows task and indications of Stage-4 moral
thinking and inversely indications of Stage-2 moral thinking in
association with lower levels of attainment on the Shadows task.
It can be speculated that as the subject moves nearer to the
equilibrium of formal operations he is more logically capable of
considering more possibilities. This ability to consider more
alternatives and to evaluate them would assist the subject to take
a more global view when faced with a moral dilemma. Due to greater
mobility and flexibility of thought at the more advanced stage it
can be suggested that feelings can become decentered from personal or
material realities and become more adequate for dealing with social
realities and even ideal realities. Lee (op.cit.) concluded that
the concrete operation component of cognitive functioning is best
related to authority type responses independent of age and to
concomitant increase in reciprocity response in the moral mode of
conceptualization. The formal operations component of cognitive
functioning best predicts the increase of "societal" moral responses.
<table>
<thead>
<tr>
<th>Operational Groups</th>
<th>Group 1</th>
<th>Group 2</th>
<th>Group 3</th>
<th>Group 4</th>
</tr>
</thead>
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<tr>
<td>N</td>
<td>35</td>
<td>33</td>
<td>46</td>
<td>65</td>
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<tr>
<td>&quot;Concrete&quot;</td>
<td>13</td>
<td>23</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>&quot;Formal&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stage ofJudgement</td>
<td>3 (2)</td>
<td>3 (2)</td>
<td>3 (2)</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Boys</td>
<td>67</td>
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<td>64</td>
<td>65</td>
</tr>
<tr>
<td>Girls</td>
<td>82</td>
<td>59</td>
<td>64</td>
<td>59</td>
</tr>
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<td></td>
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<td>20</td>
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</tr>
<tr>
<td></td>
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<td>37</td>
<td>38</td>
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</tbody>
</table>
TABLE 6.13: Piagetian Operativity (all four tests) in relation to Moral Judgement
for the Total Sample (N=23) (Percentages)

<table>
<thead>
<tr>
<th>Level of Operativity</th>
<th>Moral Judgement</th>
<th>Stage of Judgement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Early Concrete</td>
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<td>2</td>
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<td>Late Concrete</td>
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<td>7</td>
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<td>23</td>
</tr>
<tr>
<td>Late Formal</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>
Subjects categorized as "Formal" do not reveal any Stage 2 moral judgements (there is an exception of one subject for the total sample). There is considerable overlap among subjects categorized as "Concrete" and "Formal" in relation to Stage 3 moral judgements. However, inspection of the Tables reveals that there is a trend for lower percentages at Stage 3 to be associated with subjects categorized as "Formal". Within the realm of Stage 4 moral judgements, higher incidences occur among the "Formal" subjects. Any indications of Stage 5 moral judgements occur only among subjects categorized as "Formal".
Quantitative Discussion and Qualitative Observations of the Overall Piagetian Results in Relation to Other Studies

Genevan results suggested that between 11 to 16 years the adolescent makes a gradual transition from the concrete to the formal mode, beginning on average at 11 or 12 years and forming a stable, formal system of thought structures about 14 or 15 years. The emergence of formal thought in the adolescent has not been so readily confirmed by replicatory studies, relative to other Piagetian levels, and as the formal stage becomes increasingly a focus of interest, it is subject to further debate. Piaget more recently (1972 op. cit.) has acknowledged that the Genevan sample may have been based on a privileged population and that the formal stage may need review.

Table reveals that 5% of boys and 9% of girls are still at the early concrete level. 53% of boys and 53% of girls are at the late concrete stage of operativity, with 39% boys and 31% girls revealing early formal thinking. Only 3% of boys and 6% of girls are categorised as reaching the equilibrium of formal thought. This can be considered as revealing little sex difference in logical thinking within this sample. When boys and girls are combined, the percentages of the total sample at the various operational levels are: early concrete, 7%; late concrete, 53%; early formal, 36%; and late formal, 4%.

Ross (1974) for "moderate achievers", mean age 15.10 years, on the basis of Tisher's Piagetian Questionnaire, employing three experiments, reported percentages of 10, 50, 40 and 0, for early concrete, late concrete, early formal and late formal, respectively. For "high achievers", mean age 14.11 years, percentages of 0, 57, 39 and 4, were reported respectively. Tisher's (1962, 1971) investigation, employing the Questionnaire, reported for the 13.5 - 14.9 years age group, percentages of 63% for combined early and late concrete categories and 41% for combined early and late formal categories. For the 15.0 - 16.4 years age group, the percentages for the same categories were 54% and 46% respectively. These compare favourably with figures for the present investigation, although it has to be conceded that these are on the basis of the same Piagetian Questionnaire (in Ross's case, however, he used three of the four experiments). Jackson (1963) reported that 50% of his 15 year old subjects (IQ's 90-110) were at the formal level, however only 10% at Stage IIIB. This would appear to be a slightly higher percentage than in the present investigation. Dulit's (1972) 14 year old sample, selected at random, revealed a 10% incidence of fully formal thinking on the "Liquides" experiment, and 19% when using "relaxed" criteria. There were no
incidences to report with respect to the "Shadows" experiment. On the pendulum experiment alone, Somerville (1974) reported at 14 years, 54% at early formal level and 25% at late formal level.

Researches employing subjects at ages either in advance or beyond those of the subjects in the present investigation, include Field and Cropley (1969). Using Tisher's Questionnaire, among 178 subjects aged 16-18 years, they reported that of the females, 27% reached the concrete level, 58% the early formal and 15% the late formal; for males, percentages were 9, 59 and 32 at corresponding stages, respectively. It would appear that these are considerably higher than in the present sample, although it needs to be recalled that Field and Cropley's sample comprised subjects with a mean IQ of 117, all of whom were enrolled in science courses. Tomlinson-Keasey (1972) among girls, mean age 11.9; female "coeds", mean age 19.7; and women, mean age, 54 years; reported the percentages for early concrete, late concrete, early formal and fully formal as: 18, 47, 28, 4; 3, 26, 41, 26; and 15, 30, 36, 18; for the girls, "coeds" and women, respectively. Allowing for differences in chronological age, these percentages would also appear to contain similar patterning to the present investigation and it is interesting to note the almost identical percentages at the early formal stage were considerably higher. Dulit among "average" and "gifted" adolescents, 16-17 years and "average" adults, 20-55 years, recorded percentages at the fully formal level to be 35, 57 and 33 respectively for the "Shadows" experiment and 17, 62 and 25 respectively for the "Liquids". At the early formal level, percentages for "average" adolescents were 50 and 28 for "Shadows" and "Liquids" experiments respectively with percentages for "average" adults being relatively lower.

Kuhn (1971) discussing formal operational thinking among four age ranges extending from 10 to 50 years, commented that on the basis of the pendulum problem, Stage IIIB thinking was about equally frequent among the age ranges 16-20, 21-30 and 45-50, but considerably less frequent among subjects of 10-15 years. With respect to the last age range, relevant to the present study, she concluded that the results indicated that beginnings of formal operational thought may begin to appear by early adolescence in most subjects (80% of the 10-15 year group).

No significant sex differences in levels of logical operativity were identified in the present investigation which gives further credibility to the results reported by Tisher (op. cit.) and Case and Collinson (1962). These findings are however contrary to those described by Field and Cropley, Dulit, Ross and Graybill (1974) who demonstrated sex differences in favour of boys.
The analysis of the various Piagetian tests included in this investigation revealed that some proved to be more difficult than others with respect to the operational strategies involved. This finding is not at variance with observations made by other investigators. Three possible reasons can be forwarded for the variability: that there are differences in subjects' interest and experience across content domains, which Piaget has suggested; that there are differences within the difficulty of the tasks or that formal operational ontogenesis is a relatively slow process of gradual application to different kinds of content. Somerville commented that Inhelder and Piaget suggest that certain of the 16 binary operations are easier for a child to discover than others, for example, the authors claim that it is easier for the child to deal with operations "......which state that which is, and establish true implications.... (then) those which exclude that which is not and deny the false implications", (Inhelder and Piaget, 1958, p.75).
3. Discussion and Interpretation of the Results

While the preceding two sections have presented the statistical analyses and the quantitative discussion and qualitative observations of the results, the present section presents a synoptic overview drawing together the major issues and the results in relation to the MAIN HYPOTHESIS. Succeeding sections relate to the discussion of the subsidiary hypothesis, followed by an analysis of individual testing in relation to group testing.

Hypothesis One

"That a relationship exists between Piagetian operativity and moral development."

The hypothesis was confirmed using statistical measures which were all significant at the 1% level and indeed the majority were significant at 1% level or better. Tables 6.1, 6.3, 6.4, 6.5, 6.6, and 6.7 are relevant to the present hypothesis and the statistical evidence has been presented in a preceding section.

Caution needs to be exercised in the interpretation of the results: it is essential to recall that the results relate only to a narrow age range and that "late concrete" and "early formal" levels are of main concern with respect to Piagetian operativity and mainly Stages Two to Four are focused upon with respect to Moral Maturity. In the present study although the experimental procedures were aligned as closely as possible to Inhelder and Piaget's (1958) original conception, it can be hypothesised that results are not strictly comparable and when seen within the sphere of other replicatory studies, variations are bound to exist with respect to procedures in the presentation of the problems and/or evaluation of subjects' responses, together with the results being based upon different batteries of experimental tasks. However, within the confines of the study it is possible to originate interpretations of the results.

Integral to the study was the actualization in development of logical operations per se in particular, the actualization of "formal" operations. Genevan results demonstrated that between 11 to 16 years the adolescent makes a gradual transition from the concrete to the formal mode, beginning on average at 11 or 12 years and forming a stable, formal system of thought structures about 14 or 15 years. Replicatory studies however report low percentages of fully emergent formal operations in the adolescent stage. Piaget (1972, op. cit.) has acknowledged that the formal stage may require revision. However, there is sufficient
evidence of the existence of the trends described by Inhelder and Piaget for comparative analyses to be expedient. This particular investigation revealed the patterning of logical development identified in the Genevan studies and compares favourable with other replicatory studies in the field. Tables 6.8 to 6.13 inclusive, are relevant to these results and full discussion has been included in the previous section.

Fairly extensive data are available regarding the development of moral judgement itself (Kohlberg, passim). Therefore the moral judgement data for this investigation are presented in accordance with a considerable body of earlier research establishing the hierarchy of moral judgement stages. However, it has to be conceded that only a limited range of stages has been identified due to the restricted age range investigated and the full realm of stages being an age-related developmental sequence. The frequencies of stage usage found in the present investigation are comparable to those obtained for other similar adolescent samples and the data essentially provide greater evidence for the hierarchy of moral judgement stages than for the age-related developmental sequence. Moral maturity scores in this investigation ranged from 225.1 (just falling within the 2(3) - Stage) to 491 (falling within Stage-5, the only subject reaching a pure-principled level) thereby indicating that the range generally represents Stages -2(3) to Stage-4 with small percentages of subjects indicating some principled thinking.

**Present Findings and Related Studies**

Tables 6.12 and 6.13 report the stage relationships between levels of logical operativity and moral judgements for the four Piaget stage groups and for the total sample.

Subjects categorised as "Formal" do not reveal any Stage-2 moral judgements (there is an exception of one subject in the total sample – further investigation reveals that the relevant stage score is 3(2). There is considerable overlap among subjects categorised as "Concrete" and "Formal" in relation to Stage-3 moral judgements. However, inspection of the relevant Tables reveals that there is a trend for lower percentages at Stage-3 to be associated with subjects categorized as "Formal". Within the realm of Stage-4 moral judgements, higher incidences occur among the "Formal" subjects. Any indications of Stage-5 moral judgements occur only among subjects categorized as "Formal".
Considerable momentum has been added to the discussion and interpretation of the findings for the present investigation by the recent receipt (1975 private communication) of an unpublished report of the Kuhn et al. study (1971). The Kuhn study examined the development of formal operations in logical and moral judgement among 265 subjects of chronological ages ranging from 10 to 50 years, subdivided as follows: 10-15, 16-20, 21-30, 45-50 years. The main finding that fully emergent formal operations are a logical operational prerequisite to the emergence of principled moral reasoning but do not in themselves guarantee the emergence of principled reasoning, is only partly relevant to the present investigation, but the intermediary findings pertain to this present analysis. Kuhn reported that early formal operational subjects who show any principled moral reasoning are for the most part still at the predominantly conventional level. The subjects in the present investigation are in the main, at the early formal level and the low incidence of principled thinking would therefore receive credibility from the observations of Kuhn. However, it can be emphasised that any emergence of principled thinking that has been identified is associated with subjects at the early formal logical thinking stage, one at late formal. Kuhn's data further suggested in general, that the emergence of formal operations is a necessary condition for the consolidation of conventional moral judgement (i.e., pure Stage-4). She emphasises however, that such a conclusion is much more tentative on both empirical and theoretical grounds. Empirically, it is tentative because of the small number of Stage-4 subjects (N = 22). Theoretically it is less tenable that certain logical operations are a necessary condition for the consolidation of reasoning that has already developed than that they are a necessary condition for the emergence of a new form of reasoning. In the present investigation Stages-3(4), 4(3), and 4 have been grouped within one category, however closer inspection of the protocol reveals that 4 subjects reveal pure Stage-4 judgements, of these 3 are at the early formal level. These figures do not provide any greater reliability than those obtained by Kuhn. Subjects categorized as 4(3), the next highest stage, produces a total of 9 subjects, all but one of whom are "Early Formal" in logical thinking. When compared with Kuhn's figures for Stage-4(3), the present study indicates a more significant trend, for Kuhn reports from a total of 43 subjects at this moral judgement level, 24 subjects at the early formal level (19 at concrete).

Kuhn's data further indicate that the majority of subjects who are concrete operational or below show a level of moral judgement of predominantly Stage-3 or lower. Almost all of the concrete operational subjects show a moral judgement
level of no higher than 4(3). Among subjects within the early formal logical stage, in contrast, almost half have moral stage scores of 4 or higher and a third show some principled reasoning. The present study provides further credibility for these findings: the majority of concrete operational subjects fell within the Stage-3 moral judgement category or lower. Further examination of the protocols reveals that of the percentages falling into the category of 3(4), 4(3) and 4, there is a representation of 16 concrete subjects, in the total sample, 14 of whom respond in the Stage-3(4) mode. Figures are not so comparable however with respect to the early formal category as a whole, for it cannot be confirmed that almost half have moral stage scores of 4 or higher and a third showing some principled reasoning. However, this may in part be due to Kuhn's sample comprising a wider age range.

The suggestion of a relationship between the emergence of formal operational thought and the consolidation of conventional moral judgement (for the present investigation specifically Stage 4(3), for Kuhn's study, Stage 4) receives some support from a study by Lee (1971). The letter reported, among subjects 5-17 years, an overall association between the use of formal operations and the use of a type of moral judgement (Level 4: Societal) roughly equivalent to Stage-4. It is of further interest that a study by Tomlinson-Keasey and Keasey (1974) involving girls of 12-13 years recorded that the transition to formal operations that begins at this age is accompanied in the moral realm by conventional moral reasoning (numbers were however small).

Décalage

Kuhn interprets the association between the attainment of formal operations and the consolidation of conventional moral judgement to be a reflection of the consistent décalage between levels of logical and moral judgement. As stated earlier, it is less likely that formal operations are a necessary condition for the development of a Stage-4 level of moral judgement, since many subjects show some Stage-4 usage, i.e. 4(3) and 3(4) without being at the formal operational stage (although this was not completely borne out by the present investigation). The high proportion of 45-50 year olds at Stage-4 (25%) suggested to Kuhn that there may be a point of fixation at the adult level: i.e., that the moral judgement level of many adults remains at Stage-4, although these adults have the logical operational potential for principled moral judgement. The fairly high percentages of formal subjects at the Stage-3 level in the present investigation can be taken to be indicative of a décalage between levels of attainment in the logical and moral domains. Tomlinson-Keasey and Keasey (op. cit.) also confirmed a décalage between the attainment of formal operations and its application to the
area of moral reasoning and further that formal operations were not a sufficient condition for the emergence of principled (moral) reasoning among 24 College subjects. It will be recalled that Selman (1971, op. cit.) and Kohlberg and DeVries (1969, op. cit.) have also indicated a décalage between logical operativity and moral reasoning among subjects of younger ages.

Interpretations

The verification of a relationship between levels of logical operativity and moral development leads to speculation concerning the interrelationship of the two developmental sequences. Concrete logical reasoning appears to be a necessary condition for the appearance of Stage-2 moral thinking (Kohlberg and DeVries op. cit.). Awareness of logical reciprocity or reversibility can be related to moral Stage-2 which presupposes a view of human beings as individuals each with his own distinguishable perspective, although instrumental. There would appear to be two conceptual developments that are prerequisites for moral Stage-3: firstly awareness of reciprocal role-taking and secondly concepts of generalized patterns of interaction or relationships (Selman 1971). The concept of relationship may be described as a kind of "social conservation" integrating a notion of over-all social patterning; however, it is confined at Stage-3 to a primary concern for the approval of others in such relationships to the self, with an emphasis on personal role-stereotypes. The moral Stage-4 conception of a social order requires the Piagetian first-stage of formal operations in which sets of relations are first conceived as invariant systems (the present investigation, together with the studies of Kuhn, Lee and Tomlinson-Keasey and Keasey, op. cit.). This conception generates a concern for the maintenance of a system of fixed rules and for the maintenance of a system of authority. Full formal operational reasoning leads to a concern with all possible hypothetical possibilities and to an awareness of a given rule system as only one of many logically possible rule-systems. This awareness provides the basis for the restructuring of society's rules into moral principles - Stages 5 and 6.

However, it cannot be determined whether the stages of moral development reflect the application of successively more advanced logical operations in the moral domain or whether logical and moral stages constitute independent, though perhaps isomorphic developmental sequences. It can however be acknowledged that there is evidence suggesting that development in both the logical and moral domains occurs in terms of equilibrium process/auto-regulation mechanisms in which the interaction of the individual's structures with the environment, feeds back to
these structures in a way that promotes their reorganization. In the case of related structures in different domains, the hypothesis may be forwarded that it is the interaction of different, but partially overlapping, aspects of the individual's structures, with different, but partially overlapping sectors of external reality which leads to disequilibrium, reorganization and change in each of the domains: moral development may entail a somewhat (but not completely) different set of organization-environment interactions than does logical development. This leads to a further conjecture, that there are actually two kinds of interaction which are sources of developmental change. One is the interaction of the individual's structures with the structures comprising the environment. The other is the internal interaction among the structures themselves: in other words, the discrepancy between the level of development of the individual's operational structures in one domain and their level of development in another which may in itself be a source of disequilibrium, and hence change. Furthermore, each of these processes of interaction may influence and regulate the other. An interaction between a given mental structure and the environment, may stimulate a reorganization in the internal relationship or coordination of this structure and other related structures. This reorganization in turn may generate internal disequilibrium which leads to further interactions with the environment, involving both the original and related structures. Such relations are a complex form of that type which Flavell (1972) in his "An analysis of cognitive-developmental sequence" (Genetic Psychology Monographs volume 86, pp279-350), has labelled "bidirectional" in his typology of all the possible relations between one developmental phenomenon and another.

That logical operations may possibly hold a more central position in the organization of operational structures becomes tenable through the observation that logical operations appear to serve as a "pacing" mechanism in moral development, such that moral development never exceeds certain limits imposed by the individual's level of logical operations. Beyond these limitations however, there is considerable variability in the relations between subjects' logical and moral levels. Possible sources of this variability may include the extent to which logical and moral development may proceed independently: i.e. involve only partially overlapping sets of organism-environment interactions, e.g. general social experience, as indexed by chronological age may play a greater role in moral development than in logical development. Specific personal or social experience particular to the individual is a second source of variability: an individual's particular life experiences may contribute to the determination of his ultimate moral level in a way that is not the case for logical level.
8. SUBSIDIARY HYPOTHESIS

HYPOTHESIS TWO

"That measures of logical reasoning are relatively more effective indicators of moral maturity than a traditional measure of intelligence."

The hypothesis was confirmed using statistical measures. Tables 6.3, 6.4, 6.5, 6.6 and 6.7 are relevant, the statistical evidence having been presented in a previous section. The correlations confirm that both the logical operational variables and the Raven's intelligence variable are indices of mental level related to moral judgement level. However, logical reasoning measures are relatively more related to the level of moral development than the psychometric index of intelligence.

Kohlberg (1969) reports that IQ scores have only moderate correlations with his moral judgement measures, that for some stages the correspondence was negligible and that the relationship seemed to be curvilinear rather than linear. Simon and Ward (1973) in an investigation of variables influencing pupils' responses on the Kohlberg scheme of moral development focus on the disagreements concerning the relationship between moral judgement and intelligence and exploring the Raven's Matrices in relation to moral judgement, reported that intelligence level was a factor which was associated significantly with level of moral judgement. Among high, average, and low IQ groups the mean differences between each group were statistically significant at the .001 level. Graham (personal communication) employing the NFER "SVT" intelligence tests and the Kohlberg measures concluded that intelligence was significantly related to maturity of moral judgement. The product moment correlation coefficients of .53 for younger and .43 for older children were appreciably higher than .31 which Kohlberg himself gives for the correlation between IQ and moral judgement. The present study reports the same correlation between Raven's and moral judgement (Value of r = .31). Likewise, Kuhn et al (op. cit.) reported that in her main sample the correlation between IQ (WAIS, WISC) and moral score was .30 (significant |β| < .01). However for the subsidiary sample, the correlation between IQ and moral score was only .11.
Hoc correlations between the logical and moral variables were .27 for the main sample (significant, \( p < .01 \)) and .30 for sample two (significant, \( p < .01 \)).

It would be presumptuous to argue that the Piagetian tests measure real effective intelligence while the Raven's tests do not. With respect to traditional measures, Piaget (1947) in "The Psychology of Intelligence", has argued: "It is indisputable that these tests of mental age have on the whole lived up to what was expected of them: a rapid and convenient estimation of an individual's general level. But it is not less obvious that they simply measure a 'yield' without reaching constructive operations themselves. As Pieron rightly pointed out, intelligence conceived in these terms is essentially a value judgement applied to complex behaviour". Piaget (1957, and again in 1969, in "Science of Education and the Psychology of the Child") has further elaborated his views that traditional tests are concerned with quantitative measures of behaviour and do not penetrate to the actual qualitative operational mechanisms which govern the behaviour. Piaget therefore indicates that these problem-solving tasks define basic and general thought processes and assess their level more adequately than psychometric tests.

One of the strongest contrasts of the Piagetian and traditional psychometric approaches to assessment was made by Pinard and Leurendeau (1964) in a paper entitled, "A scale of mental development based on the theory of Piaget", published in the Journal of Research in Science Teaching, consider that the traditional tests produce extremely artificial scales and can hardly serve to make known the child's intellectual growth much less intellectual evolution in general. Focusing on similar criticisms of standardized tests, Wolff (1974, 1975 in private communication) hypothesizes the consequences of the possible development of a "Piaget Developmental Quotient". Lester, Muir and Dudek (1970, p.285) in a Paper: "Cognitive structure and achievement in the young child", subsequently published in the Canadian Psychiatric Association Journal maintain, "The Piaget tests seem to measure a range of structures wider than that of the traditional IQ tests. Orientational, spatial, and time concepts are involved but also the ability of the child to separate himself from the objective world to perceive himself from the objective world and
to perceive himself as one element in an outside reality". Stephens, McLaughlin, Miller and Glass (1972) maintain that Piagetian reasoning tasks involve abilities separate from those measured by standard tests of intelligence and achievement.

In commenting on the conceptual differences between Piagetian and psychometric conceptions of intelligence Elkind (1969) in a report: "Piagetian and Psychometric Conceptions of Intelligence", published in the Harvard Educational Review, maintains that the differences arise from the unique ways that each conception views intelligence and that they are focused on different aspects of intelligent behaviour, such as: (a) the type of genetic causality they presuppose; (b) the description of mental growth they provide, and (c) the contributions of nature and nurture which they assess. It may be important to acknowledge that these are conceptual similarities between Piagetian and psychometric conceptions of intelligence: both approaches share the assumption that mental ability is, at least in part, genetically determined; and both view intelligence as fundamentally rational in nature. Hathaway (in private communication, 1974, 1975) in an unpublished report: "The degree, nature and temporal stability of the relations between traditional, psychometric and Piagetian developmental measures of mental development", using 21 traditional psychometric, 10 Piagetian measures and 10 scholastic achievement variables, concluded from his research that performance on Piagetian measures was related to but not identical with performance on traditional measures of mental development and that the degree of the relationship between the two types of measures, was moderate, positive and significant: the two types of measures were neither totally distinct nor totally identical.

Although the above statements tend to promote the view that Piagetian situations measure real effective intelligence it may be more appropriate to speculate rather that the Piagetian tests require the adolescent to assimilate what is for him a complex body of information and bring to bear on it an information processing strategy which (to him) is not immediately obvious, but is nevertheless necessary to account for all of the information. Although each problem in the Raven's Progressive
Matrices is a system of thought and includes such problems as permutations of figures and resolution of figures with constituent parts, measuring fundamental aspects of cognitive performances. It may be speculated that the Piagetian tasks involve relatively more complex forms of responding, assessing the development of an adolescent's knowledge of the physical world together with his logical-mathematical knowledge.

It is pertinent to acknowledge the Mill Hill relationships with moral maturity in view of the fact that Raven advocates their accompanying use with the Progressive Matrices. Likewise, the Mill Hill cannot be said to "tap" the complex structures which the Piagetian measures assess. It can be suggested that Mill Hill is related to moral development in the sense of "tapping" the individual's ability to recall and verbally communicate his reasoning processes.

As the moral judgement dilemmas also involve complex forms of responding it is not surprising to observe that Piagetian logical measures relate relatively more to the developmental moral maturity levels than Ravens. It is suggested that the logical variables reflect major, qualitative transformations or turning points (e.g., the transition from concrete to formal operations) which appear to be of significance for moral development and which are not reflected in a general psychometric index of mental advancement.
C. OTHER ANALYSES

(a) Relation of Tisher's Questionnaire to the Individual Piagetian Testing

The Piagetian tasks, administered individually to 36 subjects selected at random included: "Combinations of Coloured and Colourless Chemical Bodies", Equilibrium in the Balance" and "The Oscillation of a Pendulum and the Operations of Exclusion", Inhelder and Piaget (1958, pp. 107-122, 164-81, 67-69, respectively). Interviews were conducted according to the clinical method developed by Inhelder and Piaget; further details of the experiments and the theoretical rationale for the distinction between stages are given in the Appendices. Subjects were seen individually, in a small room for the administration of the Piagetian tasks. Good rapport was established and all behavioural responses were recorded verbatim. The subject was required to give a reason for each response and where necessary additional questions were asked for further clarification. Throughout the entire testing the investigator was aware of the need to avoid giving subjects any extraneous or inadvertent clues by gesture, expression or tone of voice. The subjects were classified into an overall level of development on the basis of two or more problems being designated to the same level and the resulting classification was compared with the stage level assigned for Questionnaire responses. Two comparison procedures were used: initially relating "early" and "late" categories for both concrete and formal stages and secondly relating "global" concrete and formal categories. The following tables illustrate the resulting patterns:

Comparisons of Piaget individual testing to Tisher Group Questionnaire (sub-stages)

<table>
<thead>
<tr>
<th>Corresponding Classifications</th>
<th>Substages</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Concrete (2A)</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Late Concrete (2B)</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>Early Formal (3A)</td>
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<td>7</td>
</tr>
<tr>
<td>Late Formal (3B)</td>
<td></td>
<td>0</td>
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</table>

<table>
<thead>
<tr>
<th>Discrepancies</th>
<th>Individual Testing Higher</th>
<th>Questionnaire Higher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Concrete (2A)/Late</td>
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<td>1</td>
</tr>
<tr>
<td>Concrete (2B)</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Late Concrete (2B)/Early</td>
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<td>2</td>
</tr>
<tr>
<td>Formal (3A)</td>
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<td>6</td>
</tr>
<tr>
<td>Early Formal (3A)/Late</td>
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<td>4</td>
</tr>
<tr>
<td>Formal (3B)</td>
<td></td>
<td>4</td>
</tr>
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</table>

Total Subjects 36
Comparisons of Piaget individual testing to Tisher Group Questionnaire

(Concrete/Formal)

<table>
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<td>Corresponding</td>
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<td>Concrete/Formal</td>
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<td>2</td>
</tr>
<tr>
<td>Total Subjects</td>
<td>36</td>
<td></td>
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</tbody>
</table>

Comparisons on the basis of the first procedure resulted in a percentage of agreement of 61 between the individual testing and the questionnaire. When overall stage (concrete/formal) was compared the percentage of agreement was 83.

It will be recalled that Tisher (1962, 1971) reported a 77% agreement using the latter method.

(b) Relation of the Group Testing to Individual Testing - Kohlberg Moral Dilemmas

Dilemmas I, II, III and IV were administered to the subjects in the individual-interview situation in accordance with Kohlberg's "standardized" probes to gain further credence for the group-testing situation.

The two, 2-situation units were administered within one testing session, a break being permitted between each unit. All responses were recorded verbatim. Copies of the dilemmas and the respective probes are included in the Appendices.

Comparisons were made with respect to qualitative differences between the subjects' protocols obtained from the group testing and the individual testing. Dilemmas III and IV were administered in both testing situations and no significant differences were observed: the same essential responses were given with varying phraseology. With respect to Dilemmas I and II responses did not vary from the overall level of response given in the group testing situation. There was therefore no evidence that the group testing situation varied to any marked degree from the individual interviews.
CHAPTER SEVEN

IMPLICATIONS OF THE RESULTS AND INDICATIONS
FOR FUTURE RESEARCH

A. IMPLICATIONS OF THE RESULTS
B. INDICATIONS FOR FUTURE RESEARCH
A. IMPLICATIONS OF THE RESULTS

The major overall implication of this investigation may be formulated as follows:

1. Studies of the interrelationship of different variables in adolescent development are still rare, yet most desirable if one is to develop a "psychological theory" of human development as opposed to a "cognitive" or "social" or "moral" theory of human development on an empirical basis. One ultimately seeks to comprehend the whole adolescent not just one facet of him. Specific detailing of the interlocking mechanisms in the formation of such a theory has yet to be spelled out. The present study has been just one attempt towards the fulfillment of such a challenging objective. If the study has but pointed toward a significant number of psychological directions it will have fulfilled its purpose. Theories are not static nor should they be (a point which is certainly in the spirit, if not the letter) of Piaget's and Kohlberg's theory and thinking.

2. The study has given support to the existence of a relationship between logical reasoning ability and moral maturity. This implies a differing role for cognitive development than has traditionally been the case: rather than cognitive actualization being important for intellectual concerns alone, it may be seen as expedient for related developmental domains. It would seem therefore admissible for teachers in training and in practice to be made more aware of Piagetian concepts and to conceptualize cognitive development in terms of a more mobile set of criteria. By implication then, there is the need for greater diversification of the curricula content within Colleges of Education.

3. The study has provided credibility for the cognitive-developmental approach and would therefore imply support for the aim of education as being the stimulation of the next stage of development, rather than as the transmission of information (intellectual) or indoctrination into the fixed values of the school or social values (moral). A cognitive-developmental approach would stress knowledge of the adolescent's stage of functioning and arousal of genuine cognitive and social conflict and disagreement about problematic situations involving exposure to the next higher level of thought: traditional education has stressed adult "right answers", reinforcing and rewarding "right answers" and "behaving well".

4. The suggested décalage between logical and moral development and the identification of a possible discrepancy between potential development and actualized ontogenesis would suggest a necessity to focus on preventing retardation and
fixation in those adolescents beginning to lag behind.

8. INDICATIONS FOR FUTURE RESEARCH

This is the only known study of its kind which has attempted an investigation of logical reasoning in relation to moral judgement among 231 subjects aged 14 to 15 years. It must be conceded however, that the only other known closely-related study of Kuhn et al. (1971b, 1975 personal communication) comprised a more extensive age-range and gave a more comprehensive insight into the relationships under investigation. The two studies are however compatible and symbiotic in that the Kuhn et al. study provided a global analysis of the ages 10-50, and the present investigation a deeper insight into the 14 to 15 age range. The other partly related studies are Lee (1971) and Tomlinson-Keasey and Keasey (1974).

Although a range of intelligence levels, vocabulary levels, socio-economic status categories and both sexes have been included in the total sample and in the various Piaget stage groups, with suitable controls being exercised, further research may endeavour to look at a differing balance of subjects with employment of differing measures and more stringent criteria for categorization which may enhance the magnitude of differences observed.

Although appropriate statistical techniques were applied to the different types of data collected, the researcher has been aware that the investigation has been primarily correlational, making inferences of causal relations impossible. The most obvious danger of the correlational method is a tendency to infer causality when only association has been established. In such an investigation, an awareness of a number of influences in the physical and social environments of the adolescent need to be indicated. Thus, the amount of general social experiences particular to the individual constitute themselves as potent formative forces. Kohlberg (passim) stressed the centrality of role-taking for moral judgement development, together with peer-group participation, communication, emotional warmth, sharing in decisions, receipt of awarding responses, the degree of the focusing on the consequences of action to others and the amount of parental encouragement of the adolescent's participation in discussion. All of these can be taken to be examples of extraneous variables. Attempts to control for these variables present an almost insurmountable methodological problem. The fact that both hypotheses were fully substantiated, involving a sample of 231 subjects with rather complex measures and that the trends of some of the findings tend to be largely in accord with theoretical and empirical expectation, suggest that the investigational measures were, to a large extent, suitable for tapping the different realms of behaviours investigated.
Although social-class categorizations in accordance with the Registrar General's Classification (1960) were controlled in the present study, a finer categorization of social class status would perhaps have led to more perfectly matched groups. However, no such controls were reported in either the Kuhn et al. or Keasey and Keasey studies (op. cit.), or further, in any studies investigating primarily, the existence formal operations, e.g. Field and Cropley (1969), Dulit (1972) and Ross (1974) etc. and yet they confirm most of the present results. It can therefore be anticipated that a more analytical approach to e.g., family life-style, peer group participation or levels of aspirations with reference to career-after-school (Piaget emphasised the importance of the development of a "life-plan" in in relation to the emergence of formal operations, (Inhelder and Piaget, 1958) may provide greater insight with respect to the relation of the developmental domains under consideration. Likewise, birth-orders and family-size (parent-child and sibling-sibling interactions) effects are unlikely to operate independently of other familial aspects. However, with a sample of 231 children in the present study it can be speculated that there is a representative sample of varying birth orders and family size and that this factor, if at all significant would only be of importance for future research.

The results obtained in the present study must be interpreted with the awareness that only 14 to 15+ year old subjects were involved. Since responses to Piagetian tasks and Kohlberg's dilemmas are developmental in nature, it certainly would make sense to evaluate the results of a longitudinal study.

In a future study, a non-correlational study should be specifically designed to link moral development (of the kind studied here or other approaches to moral development measurement) to the logical reasoning development in children and adolescents across a number of cultures, in order to more adequately examine the effects of inhibitory or facilitatory socialization variables on the individual's auto-regulation mechanism. This endeavour requires careful long-range planning through series of preliminary investigations and may be best undertaken via corporate efforts at both national and international levels. This would seem a desirable amplification of the investigation for empirical generality.

If logical and moral judgement development is related as in the present investigation and further, there is a relation between moral judgement levels and moral behaviour Kohlberg (1971), then there must be ultimate links to be established between logical reasoning development, moral judgement and moral
behaviour. It is encouraging to note that a research, currently in progress has come to the writer's attention – Stephens et al., (1975, personal communication).

Integral to the study was the establishment of the existence of the concrete and formal operational stages identified by Piaget. It has been observed in this present exposition that the formal operational stage still requires further elaboration and review. Indeed Piaget himself (1972) has acknowledged that the "period which separates adolescence from adulthood", raises a number of unsolved questions, e.g. more research into special aptitudes and professional specializations. Ross commenting on this paper by Piaget suggests that the way that research proceeds will be more complex and difficult than before. Assuming that the formal structures are manifested within a particular aptitude context, it will first be necessary to isolate the superior aptitude of each individual and then present a formal task congruent with that aptitude. Dulit (op. cit.) has suggested that there is a need to introduce into the model at least some concept as "dropout rate" or "branching into parallel tracks" one main track would be the formal stage, but only some modest proportion of the normal population would proceed in this direction. Other tracks would represent the development of alternative patterns of thought, those alternative patterns involving only partial or minimal development of the capacity for formal stage thought. Speculation concerning these recently stated requirements together with the preceding observations embodies a multi-dimensional spectrum of awaited research.

Whatever the direction future theory and research may assume, it is the writer's hope that the present volume may offer a few rays of enlightenment.
CHAPTER EIGHT

SUMMARY

The investigation has attempted to show how Piagetian operativity relates to moral development. The particular relations that are found suggest specific aspects of logical reasoning which coexist with Kohlberg moral maturity and possibly enhance its development.

Results indicated that:

1. A relationship exists between Piagetian operativity and moral development.

2. Logical reasoning is a relatively more effective indicator of moral maturity than a traditional intelligence measure.

It is hoped that further research will serve to unravel and expound the experiential conditions responsible for the development of logical and moral schemas and more generally, contribute to the development of a comprehensive theory of maturation by clarifying the relation among different facets of adolescent development.


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APPENDIX ONE

PIAGETIAN MEASURES
THE PIAGETIAN QUESTIONNAIRE

SET 1

In the diagram on the right, the line XYZ represents a wall and a tennis ball is hit on to the wall so that it always hits at Y;

1. If the ball is hit accurately from C it will bounce to
   (a) D
   (b) B
   (c) C
   (d) A
   (e) E

   Why do you think so? ____________________________________________

2. If the ball is hit from E it will bounce to
   (a) D
   (b) B
   (c) C
   (d) A
   (e) E

   Why do you think so? ____________________________________________

3. If a ball bounces from Y to A it must have been hit from
   (a) E
   (b) A
   (c) C
   (d) B
   (e) D

   Why do you think so? ____________________________________________
Here is a new diagram; study it before doing questions 4 and 5.

If a ball is hit accurately from B to Y on the wall, it will bounce to
(a) A
(b) E
(c) F
(d) C
(e) G

Why do you think so?

If a ball bounces from Y to A it must have been hit from
(a) A
(b) E
(c) F
(d) C
(e) G

Why do you think so?
6 In the diagram on the right a ball is hit from A to a point Y on the wall. Mark in, on the diagram where the ball will go after leaving Y. Mark in the angle the new path of the ball makes with CY.

Why have you marked this angle?

7 A tennis ball is hit from somewhere in the section marked "right hand side" in the diagram below. The ball hits the wall at Y and bounces to A. Mark on the diagram the spot from which the ball was hit and mark in the size of the angle, from CY, at which the ball must hit.

People in another school marked the angle from CY as 60°. Do you think they are right? Why?/Why not?
SET 2

You have been shown a balance scale similar to the one in the diagram below. Study the diagram carefully for the questions which follow refer to it.

![Balance Scale Diagram]

Weights which can be used:

<table>
<thead>
<tr>
<th>1 Pound</th>
<th>1 Pound</th>
<th>10 Pound</th>
<th>10 Pound</th>
<th>15 Pound</th>
<th>15 Pound</th>
</tr>
</thead>
</table>

A ten pound weight is hung at C. To balance the arm again with another ten pound weight,

(a) the weight must be hung at H
(b) is impossible
(c) the weight must be hung at E
(d) the weight must be hung at J
(e) the weight must be hung at I
(f) the weight must be hung at K

Why do you think so?

A five pound weight is hung at D. To balance the arm again

(a) a one pound weight must be hung at A
(b) a ten pound weight must be hung at J
(c) a five pound weight must be hung at H
(d) a ten pound weight must be hung at E
(e) a five pound weight must be hung at K
(f) is impossible

Why do you think so?
A five pound weight is hung at E and a ten pound weight at C.
To balance the arm again,
(a) a five pound weight must be hung at G and a ten pound weight at J
(b) a ten pound weight must be hung at H and a one pound weight at K
(c) a fifteen pound weight must be hung at I and a one pound weight at H
(d) a ten pound weight must be hung at I and a five pound weight at G
(e) is impossible
(f) a five pound weight must be hung at I and a ten pound weight at G

Why do you think so?

A ten pound weight is hung at C. To balance the arm again using a fifteen pound weight,
(a) the weight must be hung at K
(b) the weight must be hung at I
(c) the weight must be hung at G
(d) is impossible
(e) the weight must be hung at E
(f) the weight must be hung at H

Why do you think so?

A ten pound weight is hung at D. To balance the arm again using a five pound weight,
(a) is impossible
(b) the weight must be hung at K
(c) the weight must be hung at I
(d) the weight must be hung at J
(e) the weight must be hung at E
(f) the weight must be hung at H

Why do you think so?
6 A ten pound weight is hung at D and a five pound weight at B. To balance the arm again,
(a) a fifteen pound weight must be hung at I
(b) a five pound weight must be hung at J
(c) is impossible
(d) a ten pound weight must be hung at J
(e) a five pound weight must be hung at K
(f) a ten pound weight must be hung at I

Why do you think so? 

7 A fifteen pound weight is hung at D and a five pound weight at A. To balance the arm again,
(a) a fifteen pound weight must be hung at K and a ten pound weight at G
(b) is impossible
(c) a five pound weight must be hung at K and a ten pound weight at G
(d) a ten pound weight must be hung at K and a five pound weight at G
(e) a fifteen pound weight must be hung at I and a ten pound weight at G
(f) a one pound weight must be hung at K and a ten pound weight at J

Why do you think so?
You have been shown a set of apparatus similar to that in the diagram below. Study it carefully, the following five questions refer to the apparatus in the sketch.

1. The container A and the container B are moved down the same distance. The water levels in the containers will
   (a) stay at the original height above the table
   (b) change so that the level in A is above the original height above the table and the level B below
   (c) change so that the level in B is above the original height above the table and the level in A below
   (d) change so that the levels in A and B are the same distance above the original height above the table
   (e) change so that the levels in A and B are the same distance below the original height above the table

Why do you think so? ____________________________________________
Container A and container B are moved up the same distance. The water levels in the containers will,
(a) stay at the original height above the table
(b) change so that the levels in A and B are the same distance below the original height above the table
(c) change so that the level in A is above the original height above the table and the level in B below
(d) change so that the levels in A and B are the same distance above the original height above the table
(e) change so that the level in B is above the original height above the table and the level in A below

Why do you think so?

When the container A is moved down and the container B stays in its original position, the water level in B will,
(a) rise above the original height above the table and will be at a different distance above the original height to the level in A.
(b) drop below the original height above the table and will be at a different distance below the original height to the level in A.
(c) will stay at the original height above the table.
(d) drop below the original height above the table and will be the same distance below the original height as the level in A.
(e) rise above the original height above the table and will be at the same distance above the original height as the level in A.

Why do you think so?
When the container $B$ is moved down and the container $A$ stays in the original position, the water level in $B$ will,

(a) drop below the original height above the table and will be at a different distance below the original level height to the level in $A$
(b) rise above the original height above the table and will be the same distance above the original height as the level in $A$
(c) rise above the original height above the table and will be at a different distance above the original height to the level in $A$
(d) stay at the original height above the table
(e) drop below the original height above the table and will be the same distance below the original height as the level in $A$

Why do you think so?

The level of the water in the container $A$ is observed to rise above the original height above the table. This seems that,

(a) the container $A$ must have been lowered and container $B$ stayed in its original position
(b) containers $A$ and $B$ must have been lowered the same distance
(c) the container $B$ must have been lowered and container $A$ stayed in its original position
(d) containers $A$ and $B$ must have been raised the same distance
(e) the container $A$ must have been raised and container $B$ stayed in its original position

People in another school said that containers $A$ and $B$ were at unequal heights. Do you think they are right? Why/why not?
The apparatus below, which is similar to the set you have seen, can be used to throw shadows on to the screen. Study the diagram carefully and then answer the questions which follow.

1. The rings A and B are placed on the line D and their shadows allowed to fall on to the screen. The two shadows that are formed
(a) will be of equal size
(b) will be of unequal size, the shadow of A being larger than the shadow of B
(c) will be of unequal size, the shadow of B being larger than the shadow of A
(d) will be of unequal size, the shadow of A being smaller than the shadow of B

Why do you think so?
2. The rings B and C are placed on the line D and their shadows allowed to fall on to the screen. The two shadows that are formed

(a) will be of equal size
(b) will be of unequal size, the shadow of B being larger than the shadow of C
(c) will be of unequal size, the shadow of C being larger than the shadow of B
(d) will be of unequal size, the shadow of B being smaller than the shadow of C

Why do you think so?

3. The ring C is placed on the line F and the ring A on the line D and their shadows allowed to fall on to the screen. The two shadows that are formed

(a) will be of unequal size, the shadow of C being smaller than the shadow of A
(b) will be of unequal size, the shadow of C being larger than the shadow of A
(c) will be of unequal size, the shadow of A being larger than the shadow of C
(d) will be of equal size

People in another school said that the shadows would be of different size. Are they right? Why? Why not?
The ring A is placed on the line E and its shadow allowed to fall on to the screen. To produce another shadow of equal size using the ring C,
(a) the ring C must be placed on the line D
(b) the ring C must be placed on the line E
(c) the ring C must be placed on the line F
(d) is impossible
(e) the ring C must be placed

(write your own answer if necessary)

The ring B is placed on the line E and its shadow allowed to fall on to the screen. To produce another shadow of equal size using the ring B,
(a) the ring B must be placed on the line D
(b) the ring B must be placed on the line E
(c) the ring B must be placed on the line F
(d) is impossible
(e) the ring B must be placed

(write your own answer if necessary)
INSTRUCTIONS FOR ADMINISTRATION OF THE PIAGETIAN QUESTIONNAIRE

1. Have available the test papers and the equipment to be demonstrated.

2. Hand out the papers. Instruct subjects to write names on test papers.

3. Warn subjects that there are several places at the ends of sets of questions where they must stop and wait until told to turn the page over.

4. Demonstrate with the ball for Set 1. The ball to be bounced against the wall. Several angles of incidence to be used.

5. Tell subjects to start the test, complete Set 1 and wait for further instructions. Request that the subjects indicate, by circling or underlining, appropriate answers in each case (on question paper), and answer the question: "Why do you think so?"

6. Demonstrate the equipment for Set 2 - a balanced or suspended rod on which positions A to K are clearly marked. Demonstrate and point out clearly by talking and pointing to the places referred to that

   (1) the arm pivots freely about its centre

   (2) the arm rests horizontally

   (a) with no weights on it

   (b) when balanced (hang equal weights from equal positions from fulcrum on each arm.)

   (c) when balanced with 4 units of weight

      5 positions from fulcrum and 2 units of weight 10 positions from fulcrum

   (d) when balanced with 5 units of weight 4 positions from fulcrum and 4 units of weight 5 positions from fulcrum

Tell students to complete Set 2 and wait for further instructions.

7. Allow time to complete Set 2.
6. Demonstrate the equipment for Set 3. Clamp each container on a tall retort stand. Use coloured water (permanganate will do). Demonstrate and point out clearly that

(a) both containers can be moved - be careful to move them **different distances**

(b) when they are moved the water level tends to change

9. Tell students to complete Set 3 and wait for further instructions. Allow time to do so.

10. Demonstrate the equipment for Set 4. Allow subjects to observe the shadows as the distance of each object from the light is varied.

11. Tell students to complete Set 4 and look back over any incompleted questions.

12. Collect test papers.
14 out of the total of 24 questions require concrete thinking for their correct solution while the remainder (10) require formal thinking.

The correct answers and their ratings are as follows:

**Concrete**
- Set 1: 1c 2d 3a 4c 5e
- Set 2: 1e 2c 3d
- Set 3: 1c 2d 3d 4a
- Set 4: 1b 2b

**Formal**
- Set 1: 6f: a line drawn from V at 40° to VC
- Set 2: 4f 5d 6d 7c
- Set 3: 5d
- Set 4: 3d 4c

5c: between E and F or 5.3 ins from lamp or 2/3 distance from lamp to E.

Titchener's criterion scores for classification of subjects into stages of mental development are as follows:

<table>
<thead>
<tr>
<th>Subjects classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score on</td>
</tr>
<tr>
<td>concrete items</td>
</tr>
<tr>
<td>formal items</td>
</tr>
</tbody>
</table>
"Combinations of Coloured and Colourless Chemical Substances"

The problem involves the combination of four odourless, colourless liquids with a fifth activating agent. The right combination of chemicals plus the activating agent causes a yellow colour (Inhelder and Piaget, 1958, pp.107-122). To solve this problem at the formal level, the operations of exclusion, conjunction and disjunction are required.

The subject is shown the four bottles labelled 1 to 4, together with the fifth smaller bottle containing the activating agent, labelled "g". A collection of test tubes is provided and the experimenter explains that prior to the entry of the subject, chemicals have been poured into two of the test tubes, taken from the bottles. The subject is invited to witness the addition of several drops of chemical from "g" to each of the amounts in the test tubes, using an "eye dropper". The subject is further encouraged to attempt to reproduce the resulting yellow colour by using the materials provided.

Subjects are asked how the colour is produced and if there are other ways to produce the same result. Further, the consideration of the effects of the various chemicals is encouraged.

The scoring procedures established relied on Inhelder and Piaget's theoretical rationale for the distinction between stages.

Stage II-A

Subjects try 1xg, 2xg, 3xg, 4xg. They only combine chemicals when the experimenter suggests the possibility and then the combinations tried are unsystematic. Subjects are likely to randomly add drops to bottles. They therefore can't reproduce the colour once they get it. Subjects often try 1x2x3x4xg repeatedly. Conclusions at this stage are usually wrong.
Stage II-B

Subjects try all four nxg combinations and then try combinations nx nxg randomly and without system. Subjects usually continue experimenting until a colour is obtained. They can then reproduce the colour when asked. Experimentation with the effects of chemicals 2 and 4 is rare. Rather the subjects conclude that these chemicals have no effect.

Stage III-A

Subjects try all nxg and most nxnxg combinations. When asked, subjects experiment with the effects of chemicals 2x4 in a systematic way.

Stage III-B

Subjects try all nxg, nxnxg, and nxnxnxg combinations. Subjects spontaneously look for the effects of chemicals 2 and 4. In addition, subjects find the solution 1x2x3xg as well as 1x3xg.

2. "Equilibrium in the Balance"

The task involves a balance and a group of weights (Inhelder and Piaget, 1958, pp.164-181). Subjects are asked how they can maintain the equilibrium of the balance. Since two unequal weights can only be balanced at proportional distances, subjects are required to attend to the role of proportionality, mechanical equilibrium, and the co-ordination of two systems of reference.

The subject is shown the supply of varying units of weight and the balance arm in equilibrium. He is invited to regain the equilibrium of the balance following the experimenter placing e.g. four units of weight five positions from the fulcrum and 4 units of weight at five positions from the fulcrum together with 2 units of weight 2 positions from the fulcrum on one arm. The subject is allowed to reproduce a similar pattern on the other arm but then encouraged to use a larger or smaller number of units of weight than that used by the experimenter.
Subjects are asked to explain how unequal weights can be balanced and requested to formulate a generalized rule.

The scoring procedures established relied on Inhelder and Piaget's (1958) theoretical rationale for the distinction between stages.

Stage IIA

Subjects place the weights randomly in an attempt to obtain balance. Weights are added and moved with no evidence of an underlying system. Therefore perseverance in the wrong direction is likely. Subjects usually find an arrangement of weights that balance, but cannot generalize at all.

Stage IIB

Subjects try to balance apparatus by rudimentary logic (i.e. by moving the lighter weight further out). They often formulate a general rule that the heavier weight must be nearer the middle and the lighter weight further out. Subjects sometimes adopt a strategy such as 3x2=6 without understanding proportionality.

Stage IIIA

Subjects discover the proportional relationship that exists between weight and distance. They can give at least two examples for each situation. Subjects indicate in their explanations that one variable compensates for the other. Their manipulations involve much less guessing than at the concrete level. However, subjects still have trouble transforming their information and generalizing it to theoretical situations.

Stage IIIB

Subjects quickly discover the proportional relationship that exists between distance and weight. Subjects can give multiple examples and can generalize to theoretical situations. Finally an adequate explanation of proportionality is given.
A pendulum is presented and the subjects are asked to determine which out of four possible variables (weight, length of pendulum, height of drop and force of push) determine the speed of the pendulum (Inhelder and Piaget, 1958, pp. 67-79). Strings suspended from a bar, serve as pendulums which can be manipulated singly or simultaneously for comparison purposes. Varying weights can also be attached to the pendulum. The solution of the problem requires subjects to isolate variables for examination, to test each variable, and to exclude irrelevant variable.

Subjects are asked what factors are important in making the pendulum go faster, together with the effect of variables not dealt with during the manipulation period.

The scoring procedures established relied on Inhelder and Piaget's (1958) theoretical rationale for the distinction between stages.

Stage II-A

Subjects usually vary at least two of the relevant variables. The serial ordering of weight is not yet accurate although the length of the string is ordered accurately. Explanations given by the subjects still show multiple contradictions about the results.

Stage II-B

Subjects can order weight and elevation. They manipulate these variables extensively. The isolation of variables occurs, but infrequently and accidentally. When asked to prove a statement, subjects will vary the factor in question with no thought of holding other factors constant. Subjects report the data accurately but are unable to transform their information or to operate mentally on the data.

Stage III-A

Subjects isolate at least three of the relevant factors and make multiple relevant comparisons on these factors. The number of manipulations is high. The comparisons are more systematic
Stage III-A cont.

then at Stage III-B (i.e. subjects will take the heaviest weight, middle, then lightest weight to see the effects of that factor). Subjects are usually able to exclude weight as a factor but exclusion of other factors is erratic.

Stage III-B

Subjects vary all four factors. Their manipulations show isolation of factors and systematic manipulation of all relevant factors. Subjects can exclude irrelevant variables after examination and can prove their conclusions.
APPENDIX IIA

MEASURES OF MORAL DEVELOPMENT
Kohlberg's Hypothetical Moral Dilemmas

**Moral Form A**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>Heinz steals the drug Law vs Moral - Life</td>
</tr>
<tr>
<td>IV</td>
<td>The wife wants euthanasia Law vs Moral - Life</td>
</tr>
<tr>
<td>I</td>
<td>The father breaks his promise Family Roles vs Justice - Property</td>
</tr>
<tr>
<td>II</td>
<td>The son tells a lie Family Roles vs Justice - Truth</td>
</tr>
</tbody>
</table>

**Auxiliary**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>XI</td>
<td>Premarital intercourse Family Roles vs Sex, Love</td>
</tr>
<tr>
<td>XIV</td>
<td>Mrs. Webster's Rooming House Civil Rights - Property</td>
</tr>
</tbody>
</table>

**Moral Form B**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>The captain orders a man to his death Authority and Justice - Life</td>
</tr>
<tr>
<td>VI</td>
<td>Choose the sickman or the troublemaker Justice - Life</td>
</tr>
<tr>
<td>VII</td>
<td>One brother steals, the other cons Law vs Justice - Property</td>
</tr>
<tr>
<td>VIII</td>
<td>The reformed criminal hasn't served his jail term Law vs Justice - Punishment</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>XII</td>
<td>Marital Fidelity Family Roles vs Sex, Love</td>
</tr>
<tr>
<td>XV</td>
<td>High School Newspaper Authority vs Civil Rights</td>
</tr>
</tbody>
</table>

**Additional Stories**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>XIII</td>
<td>Abortion Roles and Sex - Life</td>
</tr>
<tr>
<td>IX</td>
<td>Leaving one's post to help family Family Roles vs Life</td>
</tr>
<tr>
<td>X</td>
<td>Civil Rights Helping escaped slave - Civil Rights</td>
</tr>
<tr>
<td>XVI</td>
<td>Harvard Sit-In Civil Rights - Life</td>
</tr>
<tr>
<td>XVII</td>
<td>Draft Resistance Civil Rights - Life</td>
</tr>
</tbody>
</table>

Form A and B are equivalent forms for test-retest use. Each form is designed to provide two stories on each of the issues plus one story on sex and one on civil rights. Each form is divided into two blocks of two stories each. For short-form testing, the sex and civil rights stories may be eliminated.
In Europe, a woman was near death from a special kind of disease. There was one drug that the doctors thought might save her. It was a form of radium that a druggist in the same town had recently discovered. The drug was expensive to make, but the druggist was charging ten times more than the drug cost him to make. He paid £200 for the radium and charged £2,000 for a small dose of the drug. The sick woman's husband, Heinz, went to everyone he knew to borrow the money, but he could only get together about £1,000 which is half of what it cost. He told the druggist that his wife was dying, and asked him to sell it cheaper or let him pay later. But the druggist said, "No, I discovered the drug and I'm going to make money from it." So Heinz got desperate and broke into the man's store to steal the drug for his wife.

1. Should Heinz have done that? Why?

2. Was it actually wrong or right?

3. From what (if any) point of view is it wrong for him to do that? Why?

4. Is it a matter of going against the druggist's rights? Did the druggist have the right to charge that much when there was no law actually setting a limit to the price? Why?

5. Is it the husband's duty or obligation to steal the drug for his wife if he can get it no other way? Why?

If Yes:

Does that mean the wife has the right to expect him to steal the drug to save her life if there's no other way? Why?

6. If the husband does not feel very close or affectionate to his wife, should he still steal the drug?

7. Suppose it wasn't Heinz's wife who was dying of the disease but it was Heinz's best friend. His friend didn't have any money and there was no one in his family willing to steal the drug. Should Heinz steal the drug for his friend in that case, would that be different? Why?
8. **If Yes:**

Suppose it was someone dying who wasn't close to you, but there was no one else to help him. Would it be right to steal the drug for such a stranger, is it something he should do for a stranger?

9. **This is a case of stealing to save a life, what is there about the wife's life which would make a person think it is right to steal?**

10. **Suppose it wasn't his wife who was dying but the man's pet dog which he loved. Would he be justified to steal the drug for the life of his loved pet? Why?**

11. **Suppose you yourself were dying of a disease would it be right, would you have an obligation to steal the drug to save your own life?**

12. Heinz broke in the store and stole the drug and gave it to his wife. He was caught and brought before the judge and the jury found him guilty of stealing. Should the judge send Heinz to jail for stealing, or should he let him go free? Why?

13. The judge might think he would steal too if he were the husband. The judge might also think about upholding the law. How should he decide between the two?
DILEMMA IV - MORAL FORM A

The drug didn't work, and there was no other treatment known to medicine which could save Heinz's wife, so the doctor knew that she had only about 6 months to live. She was in terrible pain, but she was so weak that a good dose of a pain-killer like ether or morphine would make her die sooner. She was delirious and almost crazy with pain, and in her calm periods, she would ask the Doctor to give her enough ether to kill her. She said she couldn't stand the pain and she was going to die in a few months anyway.

1. Should the doctor do what she asks and give her the drug that will make her die? Why?

2. Life is usually a precious thing to preserve, but in this case she'll die soon anyway, and is in pain, and wants to die. What, if anything, would make it right or worthwhile to preserve her life in this case?

3. Does the woman have the right to decide what to do with her own life? Why?

4. When a pet animal is badly wounded and will die, it is killed to put it out of its pain. Does the same thing apply here?

5. How about an infant who is born a hopeless imbecile, what should one do in a case like that?

6. Would you blame the doctor in any sense for giving the woman the drug? Why?

7. Suppose the woman asked her husband for the drug, is that the same as for the doctor?

8. Some countries have a law that doctors could put away a suffering person who will die anyway, some do not. What would be right for the doctor to do where it was wasn't against the law?

9. Should the law permit or prohibit it?
10. The doctor finally decided to kill the woman to put her out of her pain, so he did it without consulting the law. The police found out and the doctor was brought up on a charge of murder. The jury decided he had done it, so they found him guilty of murder even though they knew the woman had asked him. What punishment should the judge give the doctor? Why?

11. Would it be right or wrong to give the doctor the death sentence?

12. Do you believe that the death sentence should be given in some cases? Why?
DILEMMA I - MORAL FORM A

Joe is a 14-year-old boy who wanted to go to camp very much. His father promised him he could go if he saved up the money for it himself. So Joe worked hard at his paper round and saved up the £40 it cost to go to camp and a little more besides. But just before camp was going to start, his father changed his mind. Some of his father's friends decided to go on a special fishing trip, and Joe's father was short of the money it would cost. So he told Joe to give him the money he had saved from the paper round. Joe didn't want to give up going to camp, so he thought of refusing to give his father the money.

1. Should Joe refuse to give his father the money? Why?

2. What would be the most important reason for refusing his father the money?

3. What would be the most important reason for giving his father the money?

4. Who has the right to the money and the trip, the son or the father? Why?

5. What should be the authority of a father over a son in a case like this or in general? Why?
6. What should a son do for his father here or in general, what if anything does a son owe his father? Why?

7. In terms of fairness, what is the important issue in this story?

8. Why should a promise be kept, by the father or by anyone?

9. If the son breaks promise to his father, is that better or worse than if the father breaks promise to his son? Why?
Joe wanted to go to camp but he was afraid to refuse to give his father the money. So he gave his father £10 and told him that was all he made. He took the other £40 and paid for camp with it. He told his father the head of the camp said he could pay later. So he went off to camp, and the father didn't go on the fishing trip.

Before Joe went to camp, he told his older brother, Alexander, that he really made £50 and that he lied to his father and said he'd made £10. Alexander wonders whether he should tell his father or not.

1. Should Alexander, the older brother, tell their father that Joe had lied about the money or should he keep quiet about what Joe had done? Why?

2. What would be the best reason for telling his father?

3. What would be the best reason for keeping quiet about something told you, in this case or in general?

4. How does fairness enter into this case?

5. Does whether Alex should tell depend on what they've agreed before or whether Joe has told on him in the past?
6. Alexander has to think of his brother and of his father in this case. What should a brother think of here? How should he choose between what he should do as a brother and a son?
DILEMMA V - MORAL FORM B

In Korea, a company of Marines was outnumbered and was retreating before the enemy. The company had crossed a bridge over a river, but the enemy were mostly still on the other side. If someone went back to the bridge and blew it up, with the head start the rest of the men in the company would have, they could probably then escape. But the man who stayed back to blow up the bridge would probably not be able to escape alive; there would be about a 4 to 1 chance he would be killed. The captain himself is the man who knows best how to lead the retreat. He asks for volunteers, but no one will volunteer. If he goes himself, the men will probably not get back safely and he is the only one who knows how to lead the retreat.

1. Should the captain order a man to go on this very dangerous mission or should he go himself? Why?

2. What is the best reason for saying it is right to send someone besides himself? Why or how do you say it is right to save more lives in this case, when it means ordering someone to his death?

3. What is the best, or most important reason for saying it is wrong to send someone else, when ordering someone else will save more lives?
4. Does the captain have the right or the authority to order a man if he thinks it best to? Why?

5. Would a man have the right to refuse such an order? Why?

6. The captain has a family, the men do not. Should that enter into his decision? How?

If he is going to pick someone to go, how should he pick someone? Why?

7. There is some conflict between fairness and survival here. Which is more important or how can he deal with both here? What does fairness mean anyhow and why is it important?
DILEMMA VI - MORAL FORM B

The captain finally decided to order one of the men to stay
behind. He thought he should pick one of his two demolition men.
Both of these men were trained to use dynamite to blow up bridges
or fortifications at the least risk to themselves. One of the
demolition men had a lot of strength and courage but was a bad
troublemaker. He was always stealing things from other men,
beating them up and wouldn't do his work around camp.

The second demolition man he thought of had got a bad disease
in Korea and was likely to die in a short time anyway, though he
was strong enough to do the job.

1. Should the captain send the troublemaker or the sick man? Why?

2. Whose life is worth more, the troublemaker or the sick man? Why?

3. The captain knows the sick man has a family, the troublemaker
doesn't. Should that enter into the decision? Why?

4. The captain knows that the sick man was a scientist in civilian
life who was doing valuable biochemical research toward a cure
for cancer. Should that enter into the decision? Why?

5. Does the captain have more right to send one man than the other
from the point of view of fairness? Why?

Who has more right to refuse to go, the sick man or the
troublemaker? Why?
Two young men, brothers, had got into serious trouble. They were secretly leaving town in a hurry and needed money. Karl, the older one, broke into a shop and stole £500. Bob, the younger one, went to a retired old man who was known to help people in town, Bob told the man that he was very ill and he needed £500 to pay for the operation. Really he wasn't ill at all, and he had no intention of paying the man back. Although the man didn't know Bob very well, he loaned him the money. So Bob and Karl left town, each with £500.

1. If you had to say who did worse, would you say Karl did worse to break in the shop and steal the £500 or Bob did worse to borrow the £500 with no intention of paying it back? Why?

2. Which would you rather do, which would make you feel worse: stealing like Karl or cheating like Bob?

3. When people say their conscience bothers them, what do they mean?

What does someone do when his conscience bothers him?

Do some people have more conscience than others?

Where do you fit there?
Do you think your conscience should be the basis of making a decision, or should you think of other things?

4. What was the worst thing Karl did in stealing? Why?

5. What was the worst thing Bob did in cheating the man? Why?

6. Does that enter into deciding which was worst? Why?

7. Why shouldn't someone steal from a shop or steal anyway?

8. Bob deceived the old man and agreed to do something he didn't. Why shouldn't someone do that?

9. Does the law enter into your decision in this case?

10. Both men are caught and brought before the judge. Should one be given more punishment than the other? Why?
In a country in Europe, a poor man named Valjean could find no work, nor could his sister and brother. Without money, he stole food and medicine that they needed. He was captured and sentenced to prison for six years. After a couple of years, he escaped from the prison and went to live in another part of the country under a new name. He saved money and slowly built up a big factory. He gave his workers the highest wages and used most of his profits to build a hospital for people who couldn't afford good medical care. Twenty years had passed when a tailor recognized the factory owner as being Valjean, the escaped convict whom the police had been looking for back in his home town.

1. Should the tailor report Valjean to the police? Would it be right or wrong to keep it quiet? Why?

2. What would be the best or most important reason for reporting him?

3. What would be the best or most important reason for keeping quiet?

4. If Valjean were reported and brought before the judge, should the judge send him back to prison? Why?
5. Would it be unfair or unjust to send him back to prison or would it still be just? Why?

6. Suppose that Valjean had escaped from prison and lived an ordinary life, instead of building a hospital to help other sick people. Should the tailor report him in that case? Should he be sent to prison? Why?

7. Does a citizen have a duty or obligation to report an escaped convict?

8. According to the law, a citizen is required to report an escaped convict. Is it morally right to fail to report him in that case? Why?

9. Suppose Valjean was a close friend of the tailor. Does that make a difference in what he should do? Why?
SUMMARY OF KOLBERG'S STAGE DEFINITION

Stage 0: Egocentric valuing - Judgments of good, bad, wrong not governed by rules - no sense of obligation to authority and rules, even external.

Stage 1: Orientation to obedience to power and to rules. Punishment or application of a negative label automatically makes action wrong. Concern about avoiding physical damage to person or property but not for their overall welfare.

Stage 1-B: Orientation to concrete deceit. Wrong deeds must be paid for by punishment, heroes and authorities merit special treatment or payment, etc.

Stage 2: Right action consists of that which instrumentally satisfies one's own needs and the needs of others. Human relations are viewed in terms like those of the market place. Elements of fairness, reciprocity, and equal sharing are present, but they are always interpreted in a physical, pragmatic way. Reciprocity is a matter of "you scratch my back and I'll scratch yours," not of loyalty, gratitude, or justice. A sense of concrete rights to property and to freedom, regardless of authority. A sense that the individual makes his own choice.

Stage 2-B: A clear sense of the concrete rights of others, i.e. that if I have a right so does the other and a judgment by concretely putting oneself in the other guy's place.

Stage 3: Orientation to mutual or shared norms of being good or prosocial and of concern for others. An orientation to stereotypical natural or good motives, roles or personality types. Orientation to what others expect, think or approve in the situation.

Stage 3-A: Categorical orientation to maintaining fixed rules, to maintaining respect for legitimate authority, though aware of good motives and roles involved in choice.

Stage 3-B: Orientation to maintaining mutual expectations (are the other's expectations that you be good, themselves good), to deciding by Golden-Rule role-taking (putting yourself in the other guy's shoes and seeing it from his view) and to deciding by reflecting on your own motives.
Stage 4: Orientation to society's point of view, to the perspective of the generalized other or the majority, and to maintaining a stable social system and one's own character. (Where an apparently Stage 3-A orientation clearly rests on this point of view, it is scored Stage 4. The Stage 4 orientation need not be rigidly rule-orientated, however.) A consideration of consequences for the group or society including the impact of the act upon the general expectations of members of society.

Stage 4-B: The orientation to society's point of view involves adherence to internal "moral" values and rights which are felt to be also society's values such as life, property or liberty. There is a mutuality between the individual's point of view and society's, society's point of view must show some recognition of the individual's rights and point of view.

Stage 4-1/2: Ethical relativism and egoism which rejects but is aware of Stage 4 morality or "society's point of view." At first sight these subjects seem to be mixtures of Stages 2, 4 and 5. Their egoism or relativism, however, is abstract and philosophical, not subjectivism, not concrete Stage 2 instrumentalism. Social duty is understood but questioned from the point of view of the individual making a personal decision, who can step outside society's viewpoint. Decisions tend to be made pragmatically by balancing the goods and haves in the concrete situation as they exist for: a) the actor, or b) a person in a role of social responsibility.

Stage 4(5) or 5(4): An orientation toward decision mechanisms balancing the individual's point of view and the legal or societal point of view. This is done by a rationalistic weighing of values or utilities, including long-range social expectations and functions. Laws are seen as serving social functions beyond social order and as to be modified in this light. Development of a personal point of view on reconciling social conflicts and upon how institutions should be defined.

Stage 5-A: An orientation to social welfare and social contract consistent with the rights and welfare of individuals. Right action tends to be defined in terms of general rights and in terms of standards which have been critically examined and agreed upon by the whole society. There is a clear awareness of the relativism of personal
values and opinions and a corresponding emphasis upon procedural rules for reaching consensus. Aside from what is socially agreed upon, right or wrong is a matter of personal values and opinion. The result is an emphasis upon the social point of view, but with an emphasis upon the possibility of changing law in terms of rational considerations of social utility. Outside the legal realm, free agreement and contract are the binding elements of obligations, in the context of considerations of welfare.

Stage 5-B: An orientation to a primary concern for the universal rights or the self-development and perfection of individuals as human beings. Recognizes the Stage 5 social contract but intuitively feels that individual human beings and their rights take some moral precedence over a societal perspective.

Stage 6: An orientation to respect for human personality (treat each as an end, not a means) and to principles of justice (equity or moral equality of persons) as principles defining decisions and duties. As principles, the values of respect for persons and justice are used as consistent primary grounds of decisions which are universalizable and which represent a universal "moral point of view." There is a clear awareness of, and resolution of, the problem of ethical relativity and scepticism by appeal to such universalizable principle of human morality. This viewpoint integrates the Stage 5 and 5-B perspectives.
Kohlberg's Classification of the "Issues" inherent in the moral dilemmas

A. Law - Orientations to laws and the legal system.

B. Conscience - Morality and the Choice Process.
   I. The psychological sanctions for moral action, both external and internal (punishment, approval, guilt).
   II. The spontaneous tendencies to blame, praise or excuse persons in the stories.
   III. Concepts of duty, responsibility and moral law or moral right or wrong in a concrete situation of choice, as these conflict or coincide with the actor's wish.
   IV. Overall orientation to the decision process. Is the hero expected to make a decision based on rule-following, or premeditation, or conscience-following or on justice or some mixture? Is there an evasion of decision? On what basis? (This sub-issue overlaps with B. III or information from B. II enters into it.)
   V. General moral theory - Abstract or general definitions of "moral," "duty." General notions about relativity versus objectivity of moral values, and of the relation of morality to egoism. General notions of relations of morality to law or to justice.

C. Personal-Affectional Roles and Relations.
   II. Role-stereotype of good personal roles (family, friendship) not involving concepts of affection and altruism.
   III. Relations of affection and altruism (concern for partner's welfare).

D. Authority and Civic Order Roles (where not just defined by actual law).
   II. Stereotypes and concepts of citizen and military roles.
   III. Relations of Authority, Power and Respect for Authority.
E. Civil Rights - Concerns for liberty or for all rights which are not the right to life and to property.

F. Contract, Promise, Trust and Reciprocal Exchange.

G. The disposition to punish or not punish and the reasons for it.

H. Life.

I. Property rights and rules.

II. Work-role stereotypes and norms.

J. Truth.

K. Sexual roles and values and sexual love.
GENERAL SHORT FORM DEFINITION OF

STAGES BY ISSUES

(Only issues extracted for Short-Form Scoring are included)

Reference was also made to the basic scoring document THE DETAILED ISSUE MANUAL, too lengthy to reproduce.
<table>
<thead>
<tr>
<th>Stage</th>
<th>I. Guilt and Fear</th>
<th>II. Blame and Approbation</th>
<th>III. Obligation</th>
<th>IV. Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Possibility of punishment determines should, right</td>
<td>Based on physical consequences, damage and &quot;goodness&quot; of the deviance of act</td>
<td>Absolutistic, external, coercive</td>
<td>Limited by powerlessness of actor</td>
</tr>
<tr>
<td>2</td>
<td>Punishment as one hedonistic consequence to be calculated</td>
<td>Blame-oriented to the stupid or foolish versus the sensible</td>
<td>Relativistic, instrumental to wish, hypothetical (if..then)</td>
<td>Bounded by the skin</td>
</tr>
<tr>
<td>3</td>
<td>Anticipation of approval, disapproval</td>
<td>Blame-oriented to not having good prosocial conforming motives</td>
<td>Stereotypical, what most people, good people would do</td>
<td>Limited by the presence of benevolent power authorities who take action</td>
</tr>
<tr>
<td>4</td>
<td>Guilt as a reason for following rules</td>
<td>Categorical wrongness takes priority over personal (approval) disapproval</td>
<td>Categorical, rule-determined right and wrong</td>
<td>Limited to following the rules and fulfilling assigned responsibility</td>
</tr>
<tr>
<td>5-B</td>
<td>Guilt as an act of self-judgment based on personal standards</td>
<td>Approves acts of conscience even if he disagrees with them</td>
<td>Determined by &quot;conscience&quot; by internalized but arbitrary rules</td>
<td>Responsible for &quot;living up to one's beliefs.&quot;</td>
</tr>
<tr>
<td>5-B(4)</td>
<td>Rational self-interest or social interest</td>
<td>Blame judged by impartial spectator who is a member of society</td>
<td>Determined by legal-contractual rules or by rational choice within a personal hierarchy of values</td>
<td>Limited to respecting rights of others and fulfilling contractual commitment</td>
</tr>
<tr>
<td>5-A</td>
<td>Potentiality of guilt, but principles, not guilt, the determinant of choice</td>
<td>Morality not based on praise or blame, otherwise as Stage 5</td>
<td>Determined by universal moral principles of decision</td>
<td>Responsible for all consequences of own action or inaction to which moral principles apply</td>
</tr>
</tbody>
</table>
Stage 1: Love only as passive, linking those who give to you - not a reason for doing things for others. None or very little sense of responsibility to save or help the wife in Story III situation. Insofar as there is any responsibility at all, it derives from husband's job as economic provider. No response at all for friend. No sense that father and son are, or should be, concerned about each other's welfare or feelings. Friendship and family roles do not change 'duty.'

Stage 2: Affection as hedonistically desirable, enjoy affectional relations. Oriented toward instrumental needs of having friends and relations, e.g., husband's more or less selfish need for his wife is extension of one's self and one's interests. Aware, also, of reciprocity or exchange in service to friend or wife. No fixed obligation or duty to one's relations. No concept of 'be nice' in son role. Friendship or family determine not telling on need grounds (rewards, bribes).

Stage 3: Quasi-obligatory, good and natural to feel affection in close relations. Should act out of affection. Sentiment of loyalty to family or good friends. Some idea of being nice, unselfish, sacrificing, grateful for past care. Orientation of affectional roles (husband's love for wife, friends liking him, having good reputation) motivate much of his behaviour. Whether one steels for friend depends on how good a friend, how he feels about best friend, etc.

Stage 4: A sense of categorical obligation of husband to make sacrifices to save wife regardless of degree of love for her. However, friendship and love do not change duty (give example). Affection is not obligatory but loyalty is. Must be loyal to partner or group. Differentiates husband from friend role in obligation since more than affection and reciprocity are involved in husband's obligations. Son should sacrifice interests (may be in long-range interest to do so); aware of promise = loyalty.
Stage 5: Oriented to friend and family role in terms of confidentiality, trust and understanding view one takes in friend role. Affection and loyalty as values but subordinated to welfare of individuals and to contract where conflict. Does not have a strong orientation to husband role obligations or duty. The rational husband might prefer to steal. If he does not, from his value perspective, he does not have a firm duty to steal. Essentially, husband and friend roles are matters of greater psychological concern, the moral obligation issues are based on the life involved. Some sense of father's obligation to maintain one's value of planning, maintaining purpose, as generally legitimate, has to be encouraged.

Stage 5-B: Agape or universal human love as principle.
Stage 0: No sense of authority, of a class of persons to be obeyed.

Stage 1: It is always right, or almost always right, to obey authorities. deference to authority is based only on his belonging to a class of authorities and to his superior power.

Stage 2: Little regard for respect for authorities. Sees authorities as like anyone else, and does not recognize special rights awarded to authority by the social system.

Stage 3: Respect for authority based on affection or belief in his personal virtue, his concern for subordinated, and what he has done in the past for them.

Stage 4: An internal attitude of respect for authority is expected, based on the authority representing society and order. The Authority has rights given by the order but must also earn respect.

Stage 5: Recognizes a functional need for authority roles in society but distinguishes the authority function from the person occupying the role. Sees authority subordinates as contractually committed to their roles.

Stage 6: Same as Stage 5 except that contractual and social functional definitions of authority subordinated to a concept of universal respect for persons.
ISSUE F - JUSTICE (RECIPROCITY, EQUALITY)

GENERAL - SHORT-FORM

A. Equality
B. Positive exchange
C. Negative exchange

(1) A. No sense of distributive equality - powerful deserve more.
   B. Equivalency of acts, v. than subjective values.
   C. Heteronomous compliance v. authority, whether or not right.

(2) A. Simple equality - all should get the same.
   B. Simple exchange - do favour in expectation of return.
   C. Retaliation, revenge justified as simple exchange.

(3) A. Equality - considering both sides; equity - favouring the needier.
   B. Exchange based on gratitude for past favours.
   C. Vengeance disavowed, but other's deviance partial justification.

(4) A. Distribution according to what earned.
   B. Exchange - payment of debt for merit work.
   C. Revenge no justification for deviance.

(5) A. Equality of opportunity and fundamental human-civil rights.
   B. Exchange based on contract, entered freely and with foreknowledge.
   C. Deviance neutralizes rights, expectations and conformity.

   B. General maintenance of trust.
   C. Concept of unjust expectation.
ISSUE F - PROMISE - GENERAL - SHORT-FORM

(1) A. Promises are concrete expectations, not binding.
   B. No reason for maintaining promise, other than avoidance of punishment.

(2) A. Promise is personal agreement, in context of bargain or exchange.
   B. Keep promise to maintain partner's expectation, avoid disappointment.

(3) A. Promise is personal agreement, entered in good faith.
   B. Keep promise to avoid partner's disapproval, disruption of relationship.

(4) A. Promise is categorical, binding agreement.
   B. Keep promise in order to maintain reliable social relations, avoid disappointed expectation of others.
      Bad example.

(5) A. Promise is free contract or agreement, foundation of social order.
   B. Keep promise to insure world in which anyone can plan, maintain purpose.

(6) A. Maintenance of trust is social ideal, foundation of moral relations.
   B. Maintenance of trust for its own sake, beyond contract.
ISSUE 6 - PUNISHMENT - GENERAL - SHORT-FORM

A. Judgments of punishment

B. Principles underlying punishment
   1. Retribution
   2. Restitution
   3. Social purpose - utility, deterrence, rehabilitation

C. Punishment - act of aggression, not tied to wrong-doing

1. Punishment is mechanical, necessary event following deviant response, without intervening psychological judgment of wrong-doing, no role-taking

B. 1. Primarily to harm culprit, in equal measure to act
   2. No sense of restitution
   3. Getting rid of bad people; more severe punishment, more effective it will be

2. Punishment is decided in a judgment seen so serving interests of judge, victim, or culprit (not necessarily co-ordinated), can think what the subject would do if judge, judge do if accused

B. Revenge and repayment are interchangeable appeasements to victim. Victim is only person who can demand revenge and determine amount.

Specific repayment exempts or compensates for need for revenge. Prevention, limited to specific act. Doesn't support punishment having no preventive effect; if culprit has no need to or is unlikely to repeat offence, don't punish

3. Punishment is an expression of shared judgment of disapproval of act, a stress upon the good (or bad) nature of the accused. (Attempted consistency between culprit's and judge's and victim's perspectives.)

Minimum punishment to symbolize disapproval

B. Punishment primarily for restoration and reform
   1. Minimization and defense against vengeance component
   2. Restoration involves restoring good relations between culprit and victim
   3. Main purpose of punishment is to reform culprit, strengthen his desire to be good, and restore relations to victim
(4) A. Categorical judgment of act as wrong in terms of fixed rules, regardless of motive or shape of individual, or of which the subject is, however, aware.

B. 1. Expiation, paying one's debt to society, rather than mere reparation or vengeance.

2. Criminal offenses are against society and cannot be compensated by restitution, though civil offenses can.

3. In addition to simple deterrence, punishment serves as:
   a. Learning to others - maintenance of society
   b. To make culprit feel respect for rules and authority and to feel remorse for violating them.

(5) A. Rational maintenance of rules via consistent legal procedure and due process, foreknowledge of act as punishable part of risk.

Modification by circumstances within demands of legal consistency.

B. 1. Declines legitimacy of expiation, vengeance.

Culprit, however, has lost his rights.

2. Minimization of future crime while entailing minimum suffering of culprit, within limits of consistent legal procedure.

Awareness of discrepancy between rational procedure and emotional intuition as to justice.

(6) A. Same as (5), except never should allow unjust punishment.

B. Accepts (5) view of necessity of punishment, but punishment never represents an ultimately valid moral judgment.
Stage 1: No differentiation between moral value of life and its physical or social status value. One should not kill, but there is no general obligation to preserve the lives of others.

Stage 2: The value of a human life is seen as instrumental to the satisfaction of the needs of its possessor or of other persons. Decision to save life is relative to, or to be made by, its possessor. (Differentiation of physical and interest value of life, differentiation of its value to self and to other.)

Stage 3: The value of a human life is based on the empathy and affection of family members and others toward its possessor. (The value of human life, as based on social sharing, community and love, is differentiated from the instrumental and hedonistic value of life applicable also to animals.)

Stage 4: Life is conceived as sacred in terms of its place in a categorical moral or religious order or rights and duties. (The value of human life, as a categorical member of a moral order is differentiated from its value to specific other people in the family, etc. Value of life is still partly dependent upon serving the group, the state, God, however.)

Stage 5: Life is valued both in terms of its relation to community welfare and in terms of being a universal human right. (Obligation to respect the basic right to life is differentiated from generalized respect for the socio-autonomous value not dependent upon other values.)

Stage 5-A: While life is the basic primary human right, its value in the concrete case is decided by the owner in light of hedonistic and social utilitarian considerations.

Stage 5-B: Life is a basic human right, but it is also something qualitatively higher or sacred - this sacredness is independent of direct religious or social authority.

Stage 6: Life is not only a basic right, but there is a basic obligation toward the lives of any other human. This obligation is defined in terms of respect for the personality of the other rather than by the physical survival or hedonistic interests of the other as such.
ISSUE 6 - PUNISHMENT:

SPECIFICALLY RELATING TO SITUATIONS III and IV

Stage 1 - Situation III
Thinks husband would or should be punished. Does not see any clear reason why punishment should be minimized or dispensed with in this situation. (As opposed to Stage 4 who sees the reasons for not punishing but takes a firm rule-maintaining stand.)

Stage 1 - Situation IV
Thinks doctor should be punished on probe. Doesn't consider doctor's good intentions.

Stage 2 - Situation III
Says let him go free or minimal sentence if takes judge's role at all, though may simply predict what a law-bound or unsympathetic judge might do. No reason to punish because husband had to do it, anyone would, etc.

Stage 2 - Situation IV
No punishment for doctor since she wanted it, it was best for her.

Stage 3 - Situation III
Believes judge should release husband or give him the minimal possible sentence because would understand what he did, the motives behind it.

Stage 3 - Situation IV
Modify punishment because of doctor's good motives.

Stage 4 - Situation III
Husband must be punished to maintain the law, even though he had some justification.

Stage 4 - Situation IV
Some punishment required for doctor even though meant well, in order to maintain the law.
Punishment is a matter of rationally and functionally maintaining society's rules in terms of a consistent legal procedure and due process.

See judge's role as contractually defined to apply the legal code.

Due process to be maintained in punishment even if a guilty person must be allowed to go free that way.

Legalistic concept of intent as accountability as foreknowledge and free decision - intention differentiated from goodness and badness of motive.

Well-intentioned culprit had foreknowledge that act was punishable - this was part of the risk he took.

Judge should role-take community opinion.

Shouldn't punish someone in a situation where would expect anyone to do it.

Punishment modified by circumstances within demands of legal consistency.
ISSUE II - VALUE OF HUMAN LIFE:  
SPECIFICALLY RELATING TO SITUATIONS III AND IV

Stage 1 - Situation III

Has no clear idea of the priority of life over property, law or other concrete factors in the situation, not even in the sense (Stage 2) that the husband himself sees the wife's life as far more important than all other considerations in choice. May assess wife's life as a value on the same scale as the value of the rug or of property rather than as qualitatively higher. Has no clear awareness that the woman's life should be a matter of moral concern to other people.

Stage 1 - Situation IV

May imply some "projective" value to the woman's life, or boy as a thing. Doesn't discriminate value of animal and human life though may recognize its worse to kill animals. May see the right to take the life of the woman as belonging to some external force whether husband, government, or father whose prerogatives are being interfered with.

Stage 2 - Situation III

Sees a human life as worth more than property since anyone prefers survival to property. This value, however, is not a shared moral value, it is only the person himself or people who need him who should or would make great sacrifices to preserve a life.

Stage 2 - Situation IV

Instrumental hedonistic view of life. Painful life no good. Humans different from animals only in being less dependent on others to put them away or in being less instrumentally useful to another individual. Sees the woman as having the decision since it's her life, she owns it.

Stage 3 - Situation III

Life is more valuable than property because it is the object of much greater empathy and affection.
Stage 3 - Situation IV
Value of human life rests on ego's affection for family and family's affection for ego. Expectation of both sympathy for pain by all concerned and of empathic revulsion for killing. Wants to maintain it is better for her to live. Mentions woman doesn't know what she is doing when she asks that a cure may be found.

Stage 4 - Situation III
Value of human life is based primarily on the rule "Thou shalt not kill", i.e. primarily on a negative rule rather than a positive one (save life) and on a rule rather than the value of a life. Within this sphere, recognizes the value of life as categorical and that everyone must avoid unnecessary death. This does not take clear priority over all other moral obligations, however.

Stage 4 - Situation IV
Some sense of the lesser of the two evils. A sense of life as having a value beyond its pleasure, but not absolutistic about life being of value regardless of its uses. Sees human life is categorically higher or better than animal life.

Stage 5 - Situation IV
A utilitarian view. Concerned about making a legitimate practice of euthanasia, but can't really object in this particular case. Clearly feels woman's life is eventually her right to life, to be respected and if she wants it, not really wrong when best for her.

Stage 4 (S)
While more or less aware of Stage 4 obligations to rules, roles, and life, has a more pragmatic orientation to the obvious necessity of stealing in this case based on the obvious greater importance of life than property. The orientation is neither a purely selfish determination of the decision to steal to save a life (Stage 2) nor an abstract universal principled obligation to save life as the core of morality. Stealing the drug is more than selfishly rational, it is a regard for a shared act of obvious community value. The value of life, however, is essentially utilitarian, its value to the community and to the possessor.
A choice that it is right to steal because there is a categorical obligation to save human life, that this obligation derives from a "higher law" than stealing law and the act of stealing is an act of conscience. Unlike Stage 4, the value of life is not "rule bound" but is considered to be an intrinsic quality of life. The sacredness of life derives from the fact that it is not man-made, that it is something wonderful and higher. Its value then derives from the value of God or of the universe, respect for a human life derives from respect for God or for life as a whole. The sense of conscience compelling stealing is either a direct intuition of the value or a respect for theological law.
### Issues Extracted for Short Form Scoring

#### Group Testing

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<th>Dilemma III - Issue G - Punishment (1 score)</th>
<th>Issue H - Life (2 scores)</th>
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<td>IV - Issue G - Punishment (1 score)</td>
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<td>V - Issue D - Authority Roles (1 score)</td>
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<td>VI - Issue D - Authority Roles (1 score)</td>
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<td>VII - Issue B - Conscience (1 score)</td>
<td>Issue F - Contract (2 scores)</td>
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<td>VIII - Issue D - Authority and Civic Roles (2 scores)</td>
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#### Individual Testing

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<td>I - Issue C - Personal Roles of Affection (1 score)</td>
<td>Issue F - Promise-Contract (1 score)</td>
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<tr>
<td>II - Issue C - Personal Roles of Affection (1 score)</td>
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#### Standard or Short Form Scoring

In this scoring method two issues only per story are scored.

The moral maturity score is computed by a solid stage score (indicated by a clear stage number, e.g. 3 for Stage-3) receiving a weight of 1. An ambiguous score indicated by "A" inserted before the queried stage number, weighted ½. The Moral Maturity Score is a
computation which represents the percentage usage of various stages. Moral Maturity Scores range from 100 to 600 (100 corresponding to a pure Stage-1 and 600 to a pure Stage-6). A pure stage is allocated when at least 75% of reasoning is at that stage: e.g. a MMS of 376 = Stage-4. A minor stage is given when reasoning amounts to at least 25% at that Stage: e.g. a MMS of 360 = Stage 4(3) (40% Stage 3, 60% Stage 4), a MMS of 330 = Stage 3(4) (30% Stage 4, 70% Stage 3).
Example items from The Progressive Matrices.
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SET A

Write down in a few words the meaning of each of the following words as it has been done for the first word.

1. Continue
2. Startle
3. Perfume
4. Malaria
5. Mingle
6. Fascinated
7. Brag
8. Prosper
9. Anonymous
10. Verify
11. Ruse
12. Formidable
13. Immerse
14. Docile
15. Virile
16. Sultry
17. Stance
18. Efface
19. Sensual
20. Construe
21. Conciliate
22. Garrulous
23. Latent
24. Obdurate
25. Criterion
26. Palliate
27. Adulate
28. Felicitous
29. Ambit
30. Recondite
31. Cachinnation
32. Exiguous
33. Putative
34. Manumit
SET B

In each group of six words below underline the word which means the same as the word in heavy type above the group, as it has been done in the first example:

1. CONNECT
   accident join
   lace bean
   flint field

2. PROVIDE
   harmonize commit
   hurt supply annoy divide

3. STUBBORN
   obstinate steady hopeful hollow orderly slack

4. SCOHENER
   building man ship singer plant scholar

5. LIBERTY
   worry freedom rich serviette forest cheerful

6. COURTEOUS
   dreadful proud truthful short curtsey polite

7. RESEMBLANCE
   attendance fondness assemble repose likeness memory

8. THRIVE
   flourish try thrash reap think blame

9. PRECISE
   natural stupid faulty grand small exact

10. ELEVATE
    revolve move raise work waver disperse

11. DWINDLE
    swindle pander diminish wheeze linger compare

12. LAVISH
    unaccountable selfish romantic lawful extravagant praise

13. WHIM
    complain noise tonic fancy wind rush

14. SURMOUNT
    mountain descend overcome concede appease sub

15. BOMBASTIC
    democratic pompous bickering cautious destructive anxious

16. RECUMBENT
    fugitive cumbersome unwieldy repelling reclining penitent

17. ENVISAGE
    contemplate activate surround estrange enfeeble regress

18. TRUMFERY
    worthless heraldry etiquette highest amusement final

19. GLOWER
    extinguish shine disguise gloat aerate scowl

20. PERPETRATE
    appropriate commit propitiate deface control pierce

21. LEVITY
    parsimony velleity salutary frivolity acracy tariff

22. LIBERTINE
    missionary rescuer profligate canard regicide farrago

23. AMULET
    savoury jacket flirtation crest cameo charm

24. QUERULOUS
    astringent fearful petulant curious inquiring spurious

25. TEMERITY
    impermanence rashness nervousness stability punctuality submissiveness

26. FECUND
    esculent optative profound prolific sublime salic

27. ABNEGATE
    contradict decry renounce execute belie assemble

28. TRADUCE
    challenge attenuate suspend establish misrepresent conclude

29. VAGARY
    vagabond caprice obscenity vulgarity evasion fallacy

30. SPECIOUS
    fallacious coeval palatial typical nutritious flexible

31. SEDULOUS
    rebellious dilatory complaisant diligent seductive credulous

32. NUGATORY
    inimitable adamant sublime contrary numismatic trifling

33. ADUMBRATE
    foreshadow protect detect eradicate elaborate approach

34. MINATORY
    implacable diminutive belittling quiescent depository threatening
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**Notes**

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W.G./73/100,000