THE DEVELOPMENT OF COMMUNICATIVE COMPETENCE: THE ONTOGENESIS OF JOINT CO-ORDINATED INTERACTION BETWEEN MOTHER AND INFANT.

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ABSTRACT

An analysis of mother-infant interaction during the preverbal period has revealed the importance of gaze in establishing the phatic channel and in the development of an intersubjectivity between them. Before the infant starts speaking there are behavioural indices of intersubjectivity - this enables complex tasks to be jointly accomplished.

Seven stages in the ontogenesis of joint co-ordinated activity have been identified. It is argued that there is a continuity of function between these preverbal communicative actions and later verbal behaviour.

The two theories providing the theoretical basis for this research are Speech Act Theory (Searle 1969) and Piaget's (1953, 1970) theory of cognitive development. Some modification of these theories has been necessary.

PREFACE

This research represents an attempt to develop a methodology and attendant techniques for dealing with the extremely complex communicative behaviour which develops between a mother and her infant during the infant's first months of life.

The presentation of this dissertation is unusual in that the literature review, argument, data and conclusions have not been presented as discrete units. During the preparation of the manuscript it became obvious that this usual format would result in repetition and confusion. It is hoped that the deviation from the norm has indeed contributed to clarity of exposition.

This work represents research conducted by the author and, unless specifically indicated to the contrary, the whole thesis is the original work of the author.

"Speech was not made for the purposes of description, of narrative, or disinterested considerations. To express a desire, to intimate an order, to denote a taking possession of persons or of things - these were the first uses of language. For many men they are still practically the only ones."

(Bréal 1897)

"Until writing was invented, man lived in acoustic space ... The goose quill put an end to talk ...
Whence did the wondrous mystic art arise,
Of painting speech, and speaking to the eyes?
That we by tracing magic lines are taught,
How to embody, and to colour thought."

(McLuhan & Fiore 1967)

"What does speech do? What objective function does it perform in human life - the answer is not far to seek. Speech is the great medium through which human co-operation is brought about. It is the means by which the diverse activities of men are coordinated and correlated with each other for the attainment of common and reciprocal ends."

(De Laguna 1927)

CONTENTS.

1.0 INTRODUCTION

The study of the ontogeny of language is receiving increasing attention; this is evident in the rapid escalation of publications in the area. Unfortunately, however, quantity does not always imply conceptual or methodological clarity. In fact, very often the reverse. This latter would seem to be the current situation in developmental psycholinguistics.

Studying the preverbal infant poses complex problems only some of which have been resolved. Some of these problems are simplified by studying the infant in a social setting; some, unfortunately, are exacerbated. Bever (1970) states:

> "It is indeed time to expand our horizons beyond the treatment of syntax to more inclusive treatments of language behaviour. However, we must tread carefully lest an enthusiasm to describe all available 'facts' about language leads us into the same kind of behaviourist swamp that engulfed the last structuralist period between 1920-1950. We can avoid this danger ... if we recognise that language behaviour is itself a variety of interacting systems, none of which is logically prior in its influence on language behaviour." (page 169)

In this research an attempt has been made to develop a methodology which permits an empirical investigation of prelinguistic development. It is anticipated that this may clarify some concepts and provide empirical support for various assumptions central to the theoretical position of the continuity between preverbal and verbal behaviour which will be argued for.

For clarity of exposition, in Section I some of the methodological issues associated with research of this nature have been briefly outlined. Some of these issues are specifically dealt with later in the text; others, of a more general nature, are addressed directly or indirectly throughout the text.

Section I also contains the most serious defects in method in the initial attempts to deal with the very complex social interaction between mother and infant. The capacities of the neonate and the theoretical argument of this research have been included. Section II contains the data and an interpretation of it in terms of the assumptions outlined in Section I.

In some instances the explication of concepts and their theoretical derivation occurs later in the text than their first introduction. To avoid repetition and to maintain continuity this has been necessary. Where this has occurred a footnote refers to the section in the text where the explication is to be found.

Throughout the text the following notation is used for the age of the infants:

00	:	00	:	00
Years		weeks		days

Thus 01:03:06 would refer to the age of one year, three weeks and six days.

SECTION I

2.0 METHODOLOGICAL ISSUES ASSOCIATED WITH THE STUDY OF THE ACQUISITION OF COMMUNICATIVE COMPETENCE AND LANGUAGE.

2.1 THE RELEVANCE OF MENTALISTIC CONCEPTS IN THE STUDY OF LANGUAGE.

The developmental psycholinguist's primary concern is with the ways in which language comes to be used by a child. This will include problems that many regard as philosophical problems; amongst others, problems of meaning and intention. These mentalistic concepts are essential to the arguments of the linguistic philosophers (see for example Searle 1969, Grice 1957, 1972, Austin 1962) even if they are introduced only to be disposed of (see for example Bennett's 1976 treatment of intention and teleology). Thus the psycholinguist will have to, at least initially, use the language and findings of the philosophers of language if he is not to undertake impoverished studies. Many of the studies on language acquisition have recognised this (Bruner 1975b, 1976, Ninio & Bruner 1977, Dore 1973a, 1973b, 1974, 1975, Dore, Franklin, Miller & Ramer 1976, Bates 1976, Greenfield & Smith 1976).

2.2 COMMUNICATIVE COMPETENCE AND SOCIAL STRUCTURES.

During the first two years of life an infant is transformed from an asocial to a social being. The study of this transition presents some fundamental problems. During this time the infant acquires language and becomes increasingly able to interact with members of the society.

She[1] has not merely learned a set of responses appropriate to particular situations (although she has acquired many of these) but has developed complex techniques of co-ordinating her actions with those of others, has learned rules and how to operate according to them and is able to understand the meanings of actions performed by others. In other words the infant has developed a communicative competence and a set of social structures[2] (which incorporate the communicative competence of others). These, as will become evident, undergo frequent reorganization as new schemes are assimilated into them or existing schemes are expanded to accommodate the data assimilated to them.

2.3 INTRODUCTION OF THE CONTINUITY THESIS AND THE ARGUMENT FOR A STRUCTURALIST APPROACH.

The study of the ontogeny of the processes underlying communicative competence and social structures presents very difficult methodological problems. Firstly, these preverbal communicative processes, unless one is prepared to accept a basic discontinuity in development must

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[1] The English language demands that whenever a pronoun is required, one designates a gender for the nonspecific child. It is interesting to note that this demand does not also apply to the nonspecific infant. One can say "The infant ... it ..." but not "The child ... it ..." It would seem that ordinary language reflects the presence of two different kinds of systems which are somehow present within the one system! In this text either 'it' or 'she' have been used as pronouns for the infant. The choice of one or the other is determined by the sound of the sentence. The exclusion of 'he' for the infant has occurred because the three infants who were studied in detail were females and it was decided to maintain a consistency of gender in reference to the infant both in the theoretical and data sections.

[2] See 9.2 for an elaboration of this concept.

in some sense be precursors of language. Secondly, language[1] cannot be studied at all unless an utterance (which is a communicative action and not necessarily linguistic) is considered as a set of relationships between its elements - this is a minimum requirement. To accept this one must reject the study of the elements in isolation and adopt a structural approach. Assuming a continuity thesis, this structural approach must then also be adopted with regard to the communicative actions which precede language. The rejection of the study of elements compels one to study the complex patterns of interrelated actions both intra-individual and, even more complex, inter-individual. What is being expressed here is the structural argument for the primacy of wholes and the irreducibility of them to their elements.

> "... we may say that a structure is a system of transformations. Inasmuch as it is a system and not a mere collection of elements and their properties, these transformations involve laws: The structure is preserved or enriched by the interplay of its transformation laws, which never yield results external to the system nor employ elements that are external to it. In short, the notion of structure is comprised of three key ideas: the idea of *wholeness*, the idea of transformation, and the idea of self-regulation." (Piaget 1971, page 5, emphasis added)

This structural approach does not exclude the possibility of identifying the elements of a structure and the order in which they enter the structure. It does dictate however that one must commence with the notion of the whole and work towards identifying the elements. The notion of the whole, in the communicative context, would include at least the partners in the communication and the context in which the communication occurs. Speech act theory (Searle 1965, 1969) provides the means of identifying the major elements which make up this 'whole': the speaker, the utterance sequence, the hearer, the communicative rules and the context. The speaker/hearer roles are reversible. These major elements are not discrete, they are linked by the

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[1] Used here in the broadest sense.

illocutionary force expressed in the utterance, and the illocutionary effect on the hearer[1]. The conventions which facilitate this linkage are contained in the social structures which are developing between the mother and her infant.

2.4 THE NEED FOR DESCRIPTIVE STUDIES IN LANGUAGE DEVELOPMENT.

An important lack in psycholinguistics is the dearth of adequate descriptive studies of communication. Psycholinguistics is not the only area of psychology with this deficit.

Tinbergen (1963) notes that

> "It has been said that, in its haste to step into the twentieth century and to become a respectable science, Psychology skipped the preliminary descriptive stage that other natural sciences had gone through, and so was soon losing touch with the natural phenomena." (page 411)

Medawar (1977) too recognises the need for adequate naturalistic descriptions as the prior function; he states that it is only when the basic cataloguing of the naturally occurring behaviour patterns has been completed that it is relevant to attempt to obtain information by experiment from the study of contrived behaviour. In other words the norm for the behaviour must be established initially before variations of the behaviour can have ecological validity.

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[1] These concepts are derived from Speech Act Theory (Searle 1969) and are elaborated in 7.0.

2.5 PROBLEMS ASSOCIATED WITH THE INTERPRETATION AND IDENTIFICATION OF COMMUNICATIVE BEHAVIOURS.

From the descriptions of the behaviours of the interactors the illocutionary force and illocutionary effect are inferred or attributed. Where language or conventional communicative gestures are present the attribution of illocutionary force is not difficult. One can assume that the actor is acting according to the rules[1] of the social system. However the identification of the illocutionary force in the infant because she is in the process of *acquiring* communicative skills, presents certain problems: until speech or conventional communicative gestures are present the identification of illocutionary force is usually in terms of the mother's reaction to actions of the infant which the mother recognises as having communicative significance. Many of these actions do have certain features which differentiate them, even to an observer unfamiliar with the infant from noncommunicative actions. One of these features is the direction of gaze, another which appears later than gaze is the association of specific vocalizations with certain actions[2]. Gaze and vocalization remain of central importance in mature communication.

The reliability of one's interpretations of the infant's communicative behaviours is of fundamental importance. Consider the following sequence:

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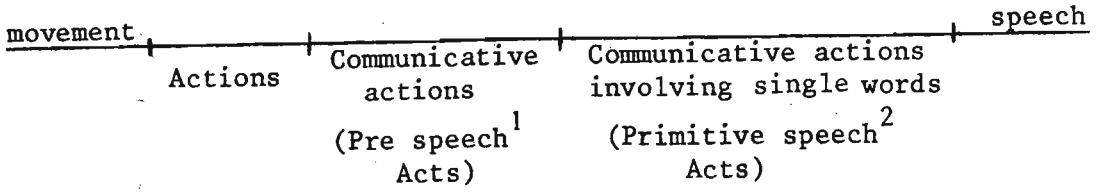
[1] Rules and their relevance to communication are discussed in 7.2.

[2] Details of these developmental sequences appear in the data.



At the two extremes a complete record is possible and unlikely to raise controversy. Observers recording the utterances of a speaker will, if they are members of the same language community, be likely to agree on the recording of the utterance and on what to exclude, for example the 'Ums' and other non language vocalizations. To describe the movements of a limb from position A to position B, though tedious if done at a microscopic level, can be accurate. Identification of movement as actions may produce some controversy, for example placing the extended index finger onto an object may or may not be a point. The actor may be testing the temperature of the object, trying to pick up a piece of fluff or cover a stain *or* he may be pointing at something. The identification of actions involves inferring the function of the sequence of movements and thus the intention of the actor. It would seem therefore that some familiarity with the cultural system is necessary. This is certainly so in the case of communicative actions where the notion of meaning and of conventions becomes central to the analysis. Thus the identification of actions depends upon both the identification of the goal and a knowledge of the social system.

The identification of communicative actions is most difficult at the Pre-Speech Act stage and in most instances depends largely upon the reactions of the mother to the infant's communicative action.

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[1] See 9.1.

[2] Dore 1973a

Frequently it is only possible to recognise the gross category of communicative action without being able to infer a specific illocutionary force. The ambiguity of the situation is reduced when conventional gestures enter the infant's repertoire and when single words become part of the total communicative action. When this occurs one can assume that many of the rules and conventions of communication have been acquired by the infant. That is that communicative competence and social structures are developing.

3.0 ASSUMPTIONS DIRECTING RESEARCH.

Two important assumptions of this research are that (1) language cannot be studied in isolation from the development which precedes the appearance of it; (2) communication cannot be studied in isolation from its social context. These two assumptions are interrelated.

3.1 CONTINUITY BETWEEN PREVERBAL AND VERBAL COMMUNICATIVE SKILLS.

Referring to language development, Marshall (1970) states:

> "What must be characterized is the shared knowledge which makes possible the 'happy' performance of speech acts. We must distinguish, then, between models of linguistic competence and what might be called models of communicative competence ... the 'competence' problem for developmental psycholinguistics could usefully be set by theories of (formal) universal grammar and of speech acts."

This distinction provides a useful division in the field of psycholinguistics into studies concerned mainly with the functional nature of communication, i.e. the communicative competence, and studies concerned mainly with the structure of language i.e. linguistic competence. These are not mutually exclusive domains, the two types of competence referred to are interdependent once language is present. However, in the infant one is concerned mainly with communicative competence: the mother involves one in considerations within both categories.

It would seem that communicative competence is a necessary condition for the establishment of linguistic competence. The necessary relationship which is being suggested between these two areas of competence establishes between the preverbal and verbal periods a continuity of

at least functions and rules.

Searle (1976) states it thus:

> "..structure, function and meaning in natural languages interact in all sorts of interesting and complex ways and it is extremely unlikely that all of the rules of structure can be stated completely independently of any of the rules for the use of structures."
> (page 1119).

Searle is not referring to the ontogeny of language but the interaction which he asserts is applicable to this developmental continuity.

Ryan (1974) strongly supports the idea of continuity. She states:

> "It is a contention ... that before the appearance of marked syntactic forms in a child's speech, the child is developing skills that *are at least as essential* to speaking and understanding language as the mastering of grammar is supposed to be."
> (page 186, emphasis added)

This continuity of development finds empirical support in Piaget's work on cognitive development[1]. He, writing with B. Inhelder in 1969, states:

> "If the child partly explains the adult, it can also be said that each period of development partly explains the periods that follow. This is particularly clear in the case of the period where language is still absent. We call it the 'sensorimotor' period, because the infant lacks the symbolic function, that is, he does not have representations by which he can evoke persons or objects in their absence ... it is during this time that the child *constructs* all the cognitive sub-structures that will serve as a point of departure for his later perceptive and intellectual development ..."
> (page 4)

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[1] The relevance of Piaget's theory to this research is dealt with more fully in 6.0.

Sinclair (1971, 1973, 1975) Sinclair de Zwart (1969, 1972, 1973) has done the majority of research within the Piagetian paradigm into language acquisition. She notes the *a priori* nature of cognition to language and on this basis argues for a continuity between preverbal and verbal behaviours:

> "Our contention would be ... that the infant brings to his language acquisition task not a set of innate linguistic universals, but innate cognitive functions which will ultimately result in universal structures of thought ... since intelligence exists phylogenetically and ontogenetically before language, and since the acquisition of linguistic structures is a cognitive activity, cognitive structures should be used to explain language acquisition ..."
> (1971, page 123)

The relationship between cognition and language has not been finally resolved[1]. The point being emphasized here is the recognition by Sinclair of the continuity between preverbal and verbal behaviours.

Bruner (1976) too recognises the relevance of preverbal behaviours to the study of language ontogeny:

> "Whatever view one takes of research on language acquisition proper - however nativist or empiricist one's bias - *one must still come to terms with the role or significance of the child's pre-speech communication system.*"
> (page 255, emphasis added)

However, not all developmental psycholinguists agree with a continuity thesis. Nelson (quoted in Ninio & Bruner 1977) regards it as a criterion which characterizes two polar positions with respect to precursors to language. But these polarizations are unlikely to be present unless a strong form of continuity is being argued for: that there will be found a complete isomorphism between behaviours in the preverbal period and language in the verbal period. Ninio & Bruner (1977) regard Bruner (1975b) as exemplifying the continuity pole and

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[1] See for example Cromer (1974).

Dore (1975) as exemplifying the discontinuity pole. It is probably on the following grounds that this position has been attributed to Dore:

> "Certainly, some forms of communicative interactions exist before language emerges, but linguistically expressed intentions are not isomorphic with prelinguistic intentions and the former need not be derived from the latter. ... in order for ... language universals to make theoretical sense, at least two psychological processes must be assumed to occur. The first process is *Emergence*. In a speech act framework the referring expression is an emergent linguistic entity, one that is controlled by maturation and not determined by the child's prior experience. A referring expression *may subsume some of the functions of communications previously accomplished* through gestures and cries, but in this view linguistic reference is discontinuous with these earlier indicating behaviours."
> (Dore 1975, page 37, emphasis added)

There seems to be some contradiction in the argument being presented here. It is doubtful whether the emergence of the referring expression is entirely controlled by maturation. The examples of children reared in virtual isolation quoted by Clark & Clark (1976) in fact contradict this; so, too, does the absence of linguistic skills including referring expressions in deaf infants. The fact that the referring expression subsumes some of the functions of communication previously accomplished in fact denies a complete discontinuity and supports the proposal for a continuity of the form suggested in this research.

3.2 THE IMPORTANCE OF A CONTEXTUAL ANALYSIS.

With reference to the second assumption, the acceptance of language as an object of study can, in part, be attributed to Chomsky's (1957, 1965) influential theory of transformational grammar. McNeill (1970) working within this paradigm proposed an innate Language Acquisition Device (LAD) which infers a discontinuity in the strong form. Under the powerful influence of transformational grammar, developmental psycholinguists

focussed their attention on language when it appeared and how it developed and largely ignored the period of life which preceded it. Implicit or explicit in all research of this nature is a discontinuity between language and earlier forms of communication. Greenfield & Smith (1976) note that in 1969

> "... there existed two main lines of relevant research. The more recent line might be called 'grammatical studies'. These studies applied various tools that had been developed in American structural and transformational linguistics to the analysis of child language ... The second, older line of research consists of studies that have touched on one word speech, ... these studies show less unity of approach, but they have developed some analytical concepts and a rich body of data that complement the linguistic methods of the grammatical studies."
> (page 2)

The inadequacy of the grammatical approach in isolation from the social is endorsed by the observations of Greenfield & Smith (1976):

> "As we come to know more about language in general and language development in particular it becomes ever clearer that communication and knowledge of the world are intrinsic to the organization of human language ... In 1967 and 1968, I was struck by the communicative power of my daughter Lauren's single word utterances. I also noticed developmental change in the range of messages she was able to convey by a single word. Upon closer observation, I concluded that she was achieving this communication by systematically combining her word with nonverbal elements in the situation - action, object, gesture, intonation and so forth."
> (page IX)

Bates (1976) also argues strongly for a broad analysis of infant communications and states somes of the effects of Chomsky's influence on developmental psycholinguistics.

> "In all revolutions a price is paid for progress. In the 1960s Chomsky's theory of transformational grammar brought about what many view as a scientific revolution in psychology. The only 'price' for unquestionable

> advances in psycholinguistic research seemed to be the loss of a few tiresome behaviourist notions that we could do without anyway. However, in child language research in particular there was another, hidden cost. Chomsky's influence brought about a concentration on formal aspects of syntax and on language as a unique, species specific system that bears no apparent relation to the development of perception, cognition, social interaction, or any of the other nonlinguistic capacities of the human child ... In short, the study of child language was - at least temporarily - cut off in theory and method from the rest of developmental psychology."
> (page XI)

This criticism of Bates' is evident in Bernstein's (1976) observation that Chomsky, by making a distinction between competence and performance,

> "neatly severs the study of the rule system of language from the study of the social rules which determine their contextual use."
> (page 329)

Chomsky is more concerned with competence than performance. Obviously in the preverbal child, assuming that this distinction is a valid one, linguistic competence as such does not enter the behavioural repertoire. One is faced with the infant performing various communicative actions which can only be interpreted within the social context in which they occur.

Bernstein recognizes that the rule system relevant to this performance must be different from the syntactical rule system referred to by Chomsky. This social rule system is the cultural system. However it is out of this that linguistic competence develops.

Habermas (1970) too rejects Chomsky's monologic model of linguistic competence in which both the speaker and the hearer are innately equipped with language acquisition devices, and also argues for a social analysis. This is evident too in Bruner's (1976) statement which supports the assumptions of both continuity and contextual analysis:

> "If we are to concentrate upon the prerequisite sensory, motor, conceptual and social skills whose co-ordination makes language possible, we must alas abandon in large part the powerful grammar-writing procedures of the developmental linguist. For it no longer suffices to collect a corpus of *spoken* language for which successive grammars may be written ... Instead we must devise ways of investigating the constituent skills involved in language. And typically one begins well before language begins ..."
> (page 256, 257)

Related to the previous discussion is the point made by McFarland (1976):

> "The concepts required for a proper understanding of behaviour, will not be explained in neurophysiological terms, because they relate to inherently hardware-independent phenomena."

The systems of rules and conventions are seen as being 'hardware-independent'[1] and therefore not explicable in terms of neurological structures (hardware). Any sort of reductionism is therefore inappropriate. This does not refute the presence of innate mental mechanisms but these will not be of the order of the LAD proposed by McNeill (1970). Chomsky (1976) has recently argued for a more realistic interpretation of his 'monologic' notion of linguistic competence. He suggests that humans, by virtue of their genetic inheritance, have cognitive systems: these systems operate according to structure dependent rules. However, the outputs of these systems cannot be determined nor can the rules be discovered by an investigation of the structures of the systems (what McFarland has termed the 'hardware'). The 'output' is related to the system only in terms of the input and the *mode of functioning* (mechanism) of the system given

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[1] The notion of 'hardware-independent phenomena' is analogous to the distinction made by Piaget in *The Origin of Intelligence in the Child* (1953) between the essentially limiting structural features (hardware) which are inherited, and the unlimited deductive and organizing activities of the mind.

that input. It is this mechanism that requires explanation. As stated by Searle (1976):

> "The interesting question about the innateness hypothesis is not whether or not the child brings to bear on his experience some complex innate mental mechanisms for acquiring language. Very few people nowadays dispute that. The question is what mechanism exactly, and what is the relation of those to the rest of the mind?"
> (page 1120)

The establishment of rules is especially relevant to understanding the mode of functioning of the social system which is developing. From two independent systems (the infant and the social world) *one* system, connected by the establishment of social structures, is evolving.

Various attempts to integrate the 'lines of research' referred to by Greenfield & Smith (1976) have recently appeared in the literature. Bloom's (1970) was the first grammatical study to make explicit use of non linguistic information in a study of child language, this was done within the framework of transformational grammar. Arguments were put forward by Schlesinger (1971) for a semantic rather than a syntactic deep structure: this theme was evident in the writing of Lakoff & Ross (1967), Bates (1976) and others. Fillmore's (1968) case grammar was incorporated into Brown's (1973) analysis of language development. These studies can be seen as crystalizing a new perspective on language acquisition. Important support for this perspective came from such philosophers as Searle (1969), Austin (1962), Grice (1957, 1972) and others. Searle's Speech Act Theory has influenced the research into language development conducted by Dore (1973a and b, 1974, 1975), Bruner (1975, 1976), Ninio & Bruner (1977) and this research. This new perspective has highlighted the importance of the preverbal development to the appearance of language. Language can no longer be regarded as appearing *de novo* at about the age of 18 months. To come to terms with the cognitive and social skills which underlie communication, the development which precedes it must be investigated. The importance of the development during infancy was recognized by,

amongst others, Piaget (1951, 1953, 1970) focussing on cognitive development; researchers studying attachment, e.g. Bowlby (1951, 1969, 1971), and many others following specific aspects of development. Currently there are many research projects which take a broader perspective on this early development and it is these which are profoundly influencing developmental psycholinguistics, e.g. Schaffer (1971, 1977), Richards (1974a, b and c, 1975a and b), Ryan (1974, 1975), etc. In these there is explicit or implicit acceptance of the continuity hypothesis, and an attempt to develop concepts which deal with the 'whole' child in its social world. This research adopts this broad perspective.

Ryan (1974) succinctly summarizes the above:

> "Within psychology, recent psycholinguistic work has neglected the earliest, presyntactic, stages of language development, concentrating exclusively on the details of the child's subsequent mastery of grammar. This approach can be characterized as exclusively cognitive, in the sense that it regards language as something to be studied as the *object* of the child's knowledge, and ignores all the other skills that determine actual language use. This neglect of what has come to be known as 'communicative competence' is not only serious in itself, but has also led to a distorted view of the child's grammatical abilities. This distortion is seen most clearly in McNeill's (1966) exaggerated claims as regards the child's 'achievements' in acquiring syntax with such alleged speed. If the acquisition of syntax were seen in a broader developmental perspective, as based on the child's pre-existing social, communicative and verbal skills, it would not seem quite the 'mystery' that McNeill (1970) supposes it to be."
> (page 185)

4.0 INCORRECT ASSUMPTIONS: THEIR RECOGNITION AND SOLUTION.

The data for this report were obtained from an ongoing interdisciplinary research project into mother-infant interaction. It commenced as a series of trial and error 'assaults' on the preverbal period. Initially there was no clear theoretical perspective or research design. One consideration which has not changed and which continues to direct this research is that communication can only be studied in use, as it facilitates, indeed enables social interaction. Thus all the data is of infants interacting with their mothers.

4.1 FOCUS ON THE TRANSITION INTO ONE WORD UTTERANCES.

The first erroneous assumption was that the period of infancy which would provide the most information into language acquisition was that just preceding the emergence of single words. It was thought that in this transition from one form of communication to another the functional continuities and structural discontinuities would be evident. However it was soon apparent that this approach was based on a far too simplistic view of the processes involved. It became evident that the selection of this transition period again implied a discontinuity with the behaviour which had preceded it. It would seem that until the processes involved are understood it is impossible to isolate any period as more important than any other. In the initial stages of this research, working with this invalid assumption, the first subject selected was Oliver aged 69 weeks at the commencement of data collection and 93 weeks when the collection was terminated. Analysis of this record made it evident that study of much younger infants was necessary. The lower limit of the age range was extended down to one day of age, the upper limit being the appearance of two word utterances.

4.2 THE INCORRECT ASSUMPTION THAT THE MOTHER HAS PRIVATE ACCESS TO THE COMMUNICATIONS OF HER INFANT.

The assumption that the mother has special and private access to her infant's communications directed the research initially into requesting the mother to act as interpreter of the interaction sequences. It was discovered during these interviews with the mother that the observer's interpretations were very similar to the mother's. In ambiguous situations the mother proceeded in a trial and error manner eliminating one by one the alternatives to what she thought the communicative action of her infant was referring. This process was available for repeated observation on the videotapes and the observer could then arrive at an interpretation in terms of the mother's action which was finally 'acceptable' to the infant. The interpretation of the infant's communicative actions is context (social and natural)dependent: This context is available on the videotape record to the observer.

The procedure of interviewing the mother after each recording session was abandoned. However throughout the period of data collection the co-operation of the mothers was enlisted. At each session they reported on any new infant behaviours which they had witnessed. Mothers were also asked to keep a list of conventional communicative gestures and words used by their infants.

4.3 THE INAPPROPRIATE OVERINTERPRETATION OF THE CHILD'S ACTIONS.

One of the easiest errors to make and possibly one of the most limiting in terms of a more complete understanding of language acquisition is that of an inappropriate overinterpretation resulting from an adultomorphic perspective of the infant's actions.

Brazelton, Koslowski & Main (1974) state:

> "... most mothers, in sum, are unwilling or unable to deal with neonatal behaviours as though they are meaningless or unintentional. Instead they endow the smallest movements with highly personal meaning and react to them effectively. They insist on joining in and enlarging on even the least possible interactive behaviours, through imitation. And they perform *as if* highly significant interaction has taken place when there has been no action at all."
> (page 68)

In other words, adults endow the infant with complexities of cognition which Piaget has shown (1953) only develop during the sensorimotor period and then require a further few years to reach equilibrium.

The errors arising from overinterpretation are easy to make, the interpretations, because they are in terms of the shared language system (which the adults possess) are very plausible, however if any progress is to be made in understanding *infant* communication they must be eradicated. Dore (1975) in a critical evaluation of holophrases suggests that a speech act (Searle 1969) approach will obviate the errors of assuming the infant to have more abilities than is warranted by the behaviour; and Howe (1976) in an excellent evaluation of the research into two word utterances states:

> "Recent attempts to classify the meanings of two word utterances expressed by young children have assumed that children always intend *one* of the meanings adults might express ... it is by no means self evidently true. Indeed, since children and adults conceptualize the world differently, they may also differ in what they choose to say about the world .... research based on the assumption that children always intend a meaning adults might express has provided interesting insights into the interpretations adults place upon children's utterances but said next to nothing about the meaning of these utterances."
> (page 29)

This criticism applies in all respects to the preverbal period;

'utterance' being replaced by 'action'[1]. It is only when there is evidence for a common conceptual framework that there is a basis for the assumption of reference to similar situations. Piaget has shown that by the end of the sensorimotor period children have constructed the concept of the concrete object, therefore at this stage it is safe on psychological grounds to assume the existence of shared reference to absent objects. Shared reference to present objects is evident during the preverbal period and can be inferred from the behaviour of the mother and infant. The behaviours from which this can be inferred are, for example, alternation of gaze between object and partner, the anticipation by either or both of the actors of units of an established sequence in interaction.

The notion of shared reference is inherent in the concept of intersubjectivity. An early expression of this principle is found in Kant's *Critique of Pure Reason* (1781, trans. N.K. Smith 1933):

> "So long therefore, as the subject views the judgment merely as an appearance of his mind, persuasion cannot be subjectively distinguished from conviction. The experiment, however, whereby we test upon the understanding of others, whether those grounds of the judgment which are valid for us have the same effect on the reason of others as on our own, is a means although only a subjective means, not indeed of producing conviction, but of detecting any merely private validity in the judgment, that is, anything in it which is mere persuasion."
> (pages 645, 646)

and, most importantly:

> "The touchstone whereby we decide whether our holding a thing to be true is conviction or mere persuasion is therefore external, namely, the possibility of communicating it and of finding it to be valid for all human reason."
> (page 645)

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[1] If utterances are seen as actions then this modification is not necessary.

The notion of intersubjectivity is a complex one. Habermas (1970) states that intersubjectivity is made possible by 'dialogue constitutive universals'. These latter allow for the interlacing of perspectives between speakers, for the relating of speakers to the referents of conversation and for other pragmatic aspects of the conversational situation. He sees these dialogue constitutive universals as being inherent in linguistic elements. One could take exception to this limitation. It is more likely that these dialogue constitutive universals are also present in the nonlinguistic elements of communication. An important feature of Habermas' argument is that communicative competence is a mastery of these dialogue constitutive universals, that is of intersubjectivity. This assertion is acceptable provided that the emphasis on linguistic elements is extended as argued above.

It is important to establish this relationship between intersubjectivity and communicative competence because, although similar, they are not synonymous. To state the relationship simply, intersubjectivity refers to a cognitive capacity of an individual to know that another individual interprets or experiences events in a manner similar to himself. This has been acquired in social interaction. Whereas communicative competence refers to the social conventions and rules[1] which make communication possible and which are shared by the members of a social group.

4.4 THE IDENTIFICATION OF COMMUNICATIVE INTERACTIONS.

In a very broad sense of the term, all behaviour is communicative in that information about an individual can be inferred from the individual's behaviour. However for the purposes of this research

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[1] These concepts are discussed in more detail in 7.2.

communication refers to the organized interaction between two or more individuals where A intends B to interpret her action in a specific manner. Thus both B and A must know the meaning of the action, and this must be a shared meaning. (This is an aspect of intersubjectivity and communicative competence.) Appropriate reactions continue the interaction. This limited use of the term communication is entirely compatible with Speech Act theory, the communication being the utterance act.

In the initial analysis of data inappropriate overinterpretation of all behaviour as communicative behaviour occurred. The reciprocal patterning of the actions of the partners contributed to this inappropriate overinterpretation of reciprocal behaviours as communicative actions. However it was soon realised that many behaviours of both the mother and the infant were not communicative. Imposing communicative functions onto them grossly distorted the analysis. The behaviour of one of the dyad, initially the mother, was often purposefully co-ordinated with that of the infant, thus the reciprocal patterning was not lost even if the actions were not communicative. For example, if the mother held out an object to the infant which the infant did not take one could assume either

(1) that the mother's intention had been 'taken up' by the infant, but ignored; or

(2) that the mother's intention had not been 'taken up' by the infant.

Thus one cannot assume that the infant's failure to act was in fact a refusal, that is, a communicative act. This would only be the case if (1) had occurred.

The technique of selecting a target process[1], e.g. fully formed

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[1] A target process is one which is easily identifiable to an observer as a complex communicative or behavioural unit. Frequently it is an action which the mother has been attempting to establish, for example, maintained eye contact either on herself or on a presented object; getting the infant to take and then to return presented objects, etc.

pointing, accurate transfer of objects between the partners, has eliminated overinterpretation. Once target processes have been identified one works backwards as far as possible from the target process, isolating and describing its precursors until a qualitative difference in the behaviour indicates that another earlier target process has been isolated, for example the target process of giving and taking was traced backwards to 00:18:05[1], the age at which the mother first introduced an object other than a part of the child's or mother's body into the joint action scheme and attempted to direct the infant's attention to it. The target process which preceded this was establishing eye-face contact, the target process which followed was incorporating the objects handed into rule following games, for example building a tower.

4.5 SYNTACTICAL ANALYSIS OF ACTIONS.

Attempting to paraphrase the communicative actions of the child and then to analyse the actions in terms of the paraphrase is a logical error which was also present in the initial stages of this research. This can be seen as an attempt to establish a continuity in the strong sense by imposing analytical structures derived from linguistics onto communicative action patterns. An isomorphism between action and linguistic unit is a necessary assumption of this procedure. There is no evidence in the literature consulted or in this research data to support this assumption.

In attempting this syntactical analysis of action the grammar used was

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[1] This study is not directed towards the establishment of age norms, nor can it be assumed that this was the first introduction of an object in this dyad. However, from this age, objects become an integral part of their interaction.

that proposed by Seuren (1969). To achieve this analysis an unacceptable distortion of the data had to take place. It proved impossible to establish generalizable criteria for the segmentation of the action to fit the structures of the grammar. On reflection the flaw in the method was the imposition of a structural analysis onto the functional features of the interaction[1].

4.6 CONCLUSION.

The approach which has evolved out of this research is regarded as a tentative solution to the complex conceptual and methodological issues involved in a study of this kind. An important realization was that communication was not something which could be studied in abstraction from the general social behaviour of the mother-infant pair, and that there is only one behaviour, it is the observer who places different emphases on to it. The following example should make this clearer.

The behaviour of a child putting forms onto a formboard can be studied with the emphasis on the cognitive aspect, the communicative aspect, the motor aspect, etc. However these are not separate entities but emphases imposed by the observer.

With the current interest in this period of development it is inevitable that out of the individual contributions of researchers, complemented by

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[1] Reyburn (1925, quoted in du Preez 1977) notes this same tendency in grammatical theory.

> "As it (grammatical theory) stands, it confuses form and function; it interlaces rules stating where words go in the sentence with rules stating how meanings are expressed; it defines parts of speech in terms of function and recognizes them by virtue of their form. It tries to do two incompatible things at once and is not conspicuously successful."
> (page 65)

conceptual clarification and improved techniques of analysis, many methods will be developed, used and rejected for better ones. If this research contributes in some way to an advance in understanding of some aspects of the social development of the infant it will have served its purpose.

5.0 THE CAPACITIES OF THE NEONATE.

"The infant's predispositions to social life do not simply consist of action patterns to which caretakers can give meaning. They also include the baby's selective attentions to the world around him. These operate in such a way that he selectively attends to features that form part of adult communication modes and so allow the formation of agreed channels for communication between adult and infant."

Richards 1974b.

5.1 INTRODUCTION.

A major problem to be faced in studying the development of communicative skills between the mother and infant is to interrelate the behaviours of two systems of very different capacities. (This is discussed in more detail in 6.3.1.2.a.) The mother is a speaking rational intentional being, the neonate has only the propensity to develop these capacities: however, as is becoming increasingly evident, the neonate's behaviour is extremely complex and organized into a system which enables discriminated responses to stimuli (Bower 1974, Fantz 1961, 1963, 1965, Lewis 1969, Wolff 1966, etc.). The infant does not yet possess the 'conventions' of interaction, he is asocial. However, the mother as a member of a particular community very soon begins to shape, by regulating her behaviour to co-ordinate with the infant's and by selective responsiveness, the infant's individual and species specific communicational proclivities to those of the adult community. The role relationships which develop between the mother and infant, the first being those of alternating actor and reactor, attending to and attended to, result from a combination of adult imposition on the sequences of behaviour emitted by the infant and the innate perceptual capacities, biological rhythms and motor behaviours of the infant.

An important feature of the biological rhythms is that the mother adapts her behaviour to fit the infant's rhythms. This is evident in Kaye's (1976) observation that the mother, during breast feeding, moves her

infant during the intervals between sucking and confines her talking and smiling to these intervals as well.

Typically the control used by the mother in attempting to establish the phatic channel[1] initially, and later to insert into this communication channel specific content is one which utilizes the spontaneous actions of the infant. Bower (1974) has shown that the infant's behaviour seems to be 'aimed at' objects and events in the world. Thus the adult interacting with the infant can take his/her cue from these 'aimed' behaviours and weave them into a form of dialogue with the infant.

Newson & Newson (1975) succinctly make an important point which is central both to Piaget's theory of development and to this report:

> "...the baby plays a very active and self directed role from the outset, the course of the ensuing dialogue is never strictly under the sole control of either partner. Whatever communication takes place, emerges as a ... product of their joint collaboration."
> (page 442)

For an understanding of the relevance of various social and natural events on the development of the communicative abilities of the infant it is necessary to examine briefly the range of behaviours of which the infant is capable as it is these to which the mother will be reacting; and the perceptual and learning capacities of the infant as these will determine what features of the environment will be responded to and what effect these will have on the infant's development[2].

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[1] Channel of communication (Jakobson 1968) e.g. eye contact, reciprocal vocalizations.

[2] This summary is not intended to be an exhaustive review of research in this area. See Bower (1974) for a more complete review.

5.2 THE RANGE OF BEHAVIOURS OF WHICH THE NEONATE IS CAPABLE.

The behaviours exhibited by the neonate have been well documented (Pratt, Nelson & Sun 1930, Irwin 1938). However, as noted by Stone, Smith & Murphy (1974), for progress in understanding, more than this type of documentation is required. This criticism is evident in a review on developmental research written 42 years ago by Evelyn Dewey (1935) in which she states:

> "In general, investigators have focussed their attention on fixing the age at which a certain reaction appeared instead of noting the sequence of reactions in the development of a total pattern."
> (page 68)

A change of direction in research was evident in Wolff's (1959) observations on newborn infants. He observed only four infants for approximately 18 hours a day for 5 days and was able, on the basis of these observations, to differentiate between various types of behaviours and to tentatively classify them according to source and according to their presumptive connections with functions of the more fully differentiated personality. This paper, according to Stone et al (1974)

> "did indeed free the field ... and was influential in setting a whole array of new problems."
> (page 240)

and helped to instigate the upsurge of interest in infant studies. Wolff showed that infants' behaviour was organized and could be divided into various states. He described these states, supplementing his original observations with observations of a further twelve infants, in 'The causes, controls and organization of behaviour in the neonate' (1966). These findings have been confirmed by Korner (1969) who elaborated to include information on individual differences evident in neonates.

The recognition of state as a variable influencing all behaviours displayed by the infant has provided a baseline from which to record

and compare infant behaviour. The following observation of Prechtl, quoted in Ambrose (1969), has been translated into empirical studies by Trevarthen (1974, 1975), Brazelton, Koslowski & Mann (1974), Bruner (1975b, 1975c, 1976) and others. Prechtl stated:

> "I am impressed by the great repertoire of newborns, but you must give them the chance to show it. If you put a newborn baby in a supine position in its cot and cover it with a blanket up to its neck, of course it gives the impression of being a kind of vegetable which just cries and sucks from time to time and that's all."
> (page 98)

Placing the neonate in a specially designed infant's chair e.g. that designed at the Center for Cognitive Studies in Harvard which minimizes the restrictions on its movements has provided some very interesting results, e.g. Brazelton et al (1974), Trevarthen (1974, 1975, 1977), Condon (1975). However, it is more than just the removal of physical constraints on the infant's movements which has led to the proliferation of studies on the neonate, it is also acceptance by research workers that the infant is an active being capable of extremely complex behaviour and of selective reaction.

As in all other spheres of developmental research Piaget has made an important contribution with his detailed accounts of observed behaviour in the infant, and the incorporation of these observations into a systematic theory. However, a criticism of Piaget's account of development during the first two years of life is his dismissal of the first month of life as being a period dominated by reflexes. This is unjustified as it implies that there is very little modification of the neonatal behaviours present in the first month. As will be evident in the data, observations in this study of an infant over this four week period reveal that much change does take place. Piaget's observations are centred on the infant interacting with objects whereas the observations in this study have centred on the infant in interaction with people. This difference in focus is probably largely responsible for the difference of opinion. The changes are not necessarily in the form of the behaviours exhibited by the neonate but in the

interrelationship of the behaviours with the actions of the mother.

The neonate is capable of clinging behaviour, sucking behaviour, visually tracking a light, pupillary dilatation and constriction, the rooting reflex, moro reflex, walking reflex, withdrawing from painful stimuli, crying, coughing, lifting its chin from a prone position, vomiting, grasping an object placed in its palm, righting reflex, and many other reflexes. The majority of these behaviours and reflexes[1] are essential for survival and seeing them only in this dimension provides a bias towards an individual biological type of analysis which ignores the social relevance of these behaviours.

Bowlby (1951, 1965, 1969) incorporated some of these behaviours, e.g. crying, smiling, clinging, visually following (which he termed the Component Instinctive responses), into his theory of attachment (1969). Influenced by Bowlby, much of the research into early development focussed on the attachment bond (Ainsworth 1967, 1973, Robertson 1958, Schaffer & Emerson 1964, Anderson 1972, Main 1977, etc.). Recently there has been increasing criticism of this rather narrow perspective. Richards (1974b) and Bernal (1974) amongst others, criticise this preoccupation with attachment to the exclusion of the broader social processes involved. If the dimension is broadened to include the organization of these component instinctive responses and other infant behaviours into patterns interrelated with the mother's behaviour each one assumes individual *and* social relevance. These neonatal behaviours provide an essential part of the framework around which the mother organizes her interactions with her infant. From the first interaction they are therefore essential to the establishment of social structures[2]

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[1] It is necessary to distinguish between these two terms. Reflexes are well defined and limited behaviours which are elicited by a specific stimulus. Behaviour is therefore the more general term.

[2] See 9.2 for details of development of these structures.

which develop between them. The descriptions in this report provide support for Richards' postulate that the infant is asocial[1] at birth but that, by the nature of mother-infant interaction organized in large part by the mother around the behaviours of her infant, social actions become increasingly part of the infant's behavioural repertoire.

5.3 DISCRIMINATION BY THE INFANT BETWEEN SOCIAL AND NON SOCIAL STIMULI.

It is now firmly established that the infant's attention, far from being random, is highly discriminative. Perhaps the most important discrimination (based on differential response) the infant makes is that between social and non social stimuli (Trevarthen 1974, 1975, 1977, Brazelton et al 1974).

Brazelton et al (1974) described the behaviour of infants in these two situations. Confronted with an object:

> "The infant stared fixedly (at the object) with wide eyes ... without disruption of gaze or attention ... his face was fixed ... the body was set in a tense immobilized ... position ... in this period, his attention seemed 'hooked'[2] on the object ..."
> (pages 53, 54)

In contrast, when regarding the mother the following behaviour is evident:

> "As she (the mother) responds to his looking at her, the infant assumes a state of attention in which he alternately sends and receives cues ... arms and legs may pedal slowly

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[1] This is discussed in 5.7.

[2] Stechler & Latz (1966) refer to obligatory attention, a term which is used by Bruner (1969).

> ... hands and feet open and close smoothly. (There is a) ... constant waxing and waning of degree of tension in all parts of the body ..."
> (page 54)

The 'hooked' attention referred to above is important in establishing joint attention onto an object. This will be evident in the data.

In the research referred to above the infants were assessed in an experimental situation in which either a social object or an object was presented to them. In the natural environment there is seldom an 'object only' stimulus, all presentations are by the mother who talks to, encourages, and touches the infant during the presentation. In this study 'hooked' attention was first seen in Julie at 31 days and subsequently, when the infant, during scanning of her environment, fixated on an object e.g. light, mobile, etc. She selected these from the array of stimuli available. Once she had become 'hooked' onto an object it was extremely difficult for the mother to break this attention. Verbal and tactile attempts were seldom successful and on a number of occasions the mother had to move the infant or project her face between the infant and the stimulus to get Julie to react to her.

Bruner (1969) describes the infant's attention during the first six weeks of life as highly distractible; the period between six weeks and sixteen weeks as characterized by obligatory attention. It is only after this that the infant seems able to detach easily from one aspect of the stimulus field to move to another. This is referred to as biphasic attention.

5.4 THE CAPACITIES OF THE VISUAL AND AUDITORY SYSTEMS OF THE INFANT.

The perceptual modalities to be considered in some detail are those of vision and audition. These have been selected because they are considered to be the most relevant to the establishment of social responses. The capacities of the auditory and visual systems of the

neonate are different to those of the adult. Studying these capacities in the infant enables one to understand why the behaviours of mothers interacting with infants are fairly consistent between individuals and cultures.

It is important, in making sense of the world, to be able to localise a stimulus with reference to oneself. With some stimuli the infant is capable of fairly accurate localization within a few hours of birth. This is important in the context of mother-infant interaction in that the mother's reactions to the infant's behaviours are usually in terms of what she considers to be the intentions of the infant, e.g. the rooting reflex determines that the infant turns its head towards the same side as the cheek which is being stimulated by touch. Thus when placed at the breast the infant will turn towards the nipple. The mother may interpret this as the infant seeking the nipple. The mother's interpretation of the infant's behaviour in terms of intention is of fundamental importance in shaping their interactions and in imposing on them the regularity which is necessary for the establishment of integrations and co-ordinations between them.

5.4.1 Auditory Localization.

Sound localization is dependent upon the time difference in the onset of stimulation at the two ears[1]: the *more* a sound source deviates from the straight ahead position the greater will be the phase difference. Inter-aural distance will also affect this. (See figure 1)

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[1] That is, phase differences in acoustic stimulation of the ears will be interpreted centrally in terms of deviance from the midline of the sound source.

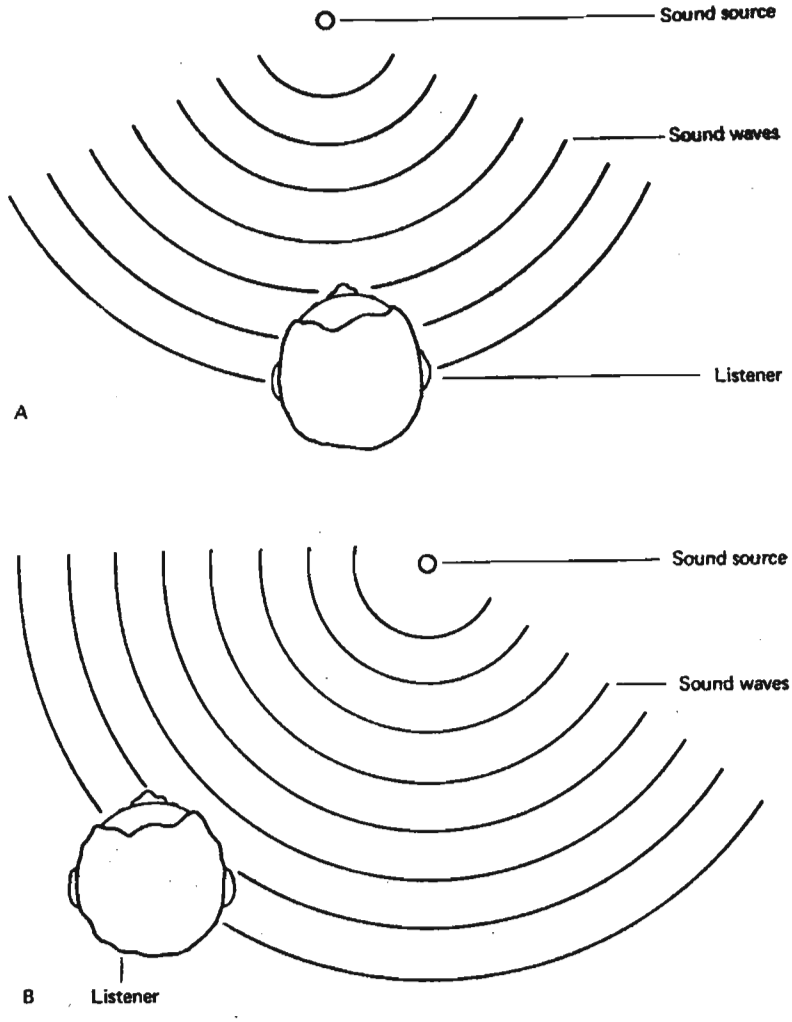

Figure 1 Relationship Between Direction of Sound Stimulus and Time of Onset of Aural Stimulation.

A. Sound source straight ahead. Sound reaches both ears simultaneously.

B. Sound source on right. Sound reaches right ear first.

(Bower 1974, page 22)

The inter-aural difference of the neonate is considerably less than that of the adult: inter-aural distance approximately doubles between birth and adulthood. (See figure 2)

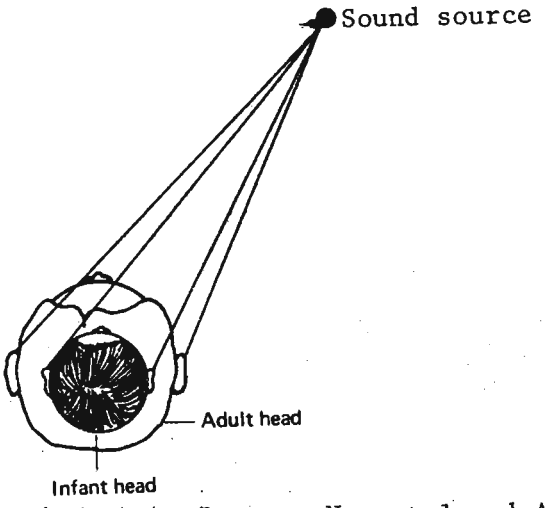

Figure 2 Interaural Difference Between Neonatal and Adult Heads.

Because of the difference in head size, the time difference in arrival of a sound at the two ears is less for an infant than for an adult.

(Bower 1974, page 26)

Location of sound at the straight ahead position will not be affected by the reduced inter ear distance, nor will the ability to differentiate between sounds to the left or right of the midline (Wertheimer 1961); however, the ability to localize a sound source in any and every position is probably not present in the infant (Bower 1974). Bower & Wishart (1973) have shown that auditory-motor accuracy at below six months of age at positions off the midline is less than that for visual motor accuracy. The infant can turn its head towards either the right or left in response to auditory stimulation (Wertheimer 1961, Siqueland & Lipsitt 1966) and in this way bring an off midline stimulus into the midline and thus facilitate visual fixation. However the association of visual and auditory stimuli cannot be assumed in the neonate. Aronson & Rosenbloom (1971) have demonstrated that infants from 30 days perceive auditory and visual information within a common space[1].

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[1] Accurate sound localization in the adult is heavily dependent upon vision.

Piaget (1953) suggests that the co-ordination between vision and audition begins during the second stage of the sensorimotor period, that is between one and four months of age. The absence of this co-ordination in the first month of life is unlikely to have a marked effect on the infant's interaction with its mother. The situations of most intense interaction between the mother and infant favour midline verbalizations from the mother - this is clearly evident in the verbal games introduced by the mother as early as four weeks (see obs. 1 & 2, pages 39-41).

The mother's behaviour would also assist the reciprocal assimilation between vision and hearing for example in face to face situations with their infants, mothers usually use exaggerated mouth and expression movements while vocalising; the utterances are often repeated and are usually uttered in a raised intonation pattern. Another feature is that the mother moves her head either from side to side nodding it or approaching then withdrawing from the infant.

The biological constraints on their early interactions, e.g. feeding, cleaning, favour midline stimulation of both the visual and auditory perceptual modalities of the infant. Collis (1977) notes that in certain situations many of the mother's movements when interacting with her infant can be understood in highly functional terms as adjustments to achieve or maintain a reasonably good view of the infant's face. However these functional adjustments have the unintended consequence of maximising on the perceptual capacities of the infant.

The advantage of the constraints on interaction facilitating midline interaction must not be viewed entirely in terms of the infant's gain. The infant's face as the most expressive region of its body is available to the mother to monitor the course of the interaction, facilitating the very subtle adjustments which are a feature of their interaction. Midline interactions provide her with the best view of the face.

Thus any capacities of the infant which facilitate attention on the mother will increase the duration and complexity of their interactions

and thus contribute to the development of co-ordinations and conventions between them, all of which are necessary for symbolic communication.

Verbal games initiated by the mother are a common feature of mother-infant interaction. These games favour midline auditory and visual stimulation of the infant, as the following two examples illustrate.

Obs. 1 - J 00:04:03

The infant (without a nappy) is lying on the table. The mother, working slightly to the left of the infant, puts some cream on her hand, and then comes forward as if to put the cream onto the infant's bottom but instead leans forward directly over the infant. The infant's head is turned towards the left and the mother directs her head in this direction as well. Her face is approximately 20 cms from the infant's face, and she says, "You kick nicely, you kick", touching the child's tummy. After this interchange the infant again turns its head right over towards the left. After cleaning the infant's bottom, the mother again touches the child's tummy, and says, "Come on, you kick", but this time the vocalization would be entering the right ear only, the left ear being on the blanket. There is no attempt by the infant to turn to face the mother's voice. The mother tries on a number of occasions to get the infant to turn in the direction of her voice by holding the infant's legs and going, "Come on, kick, kick, kick. Hey, Julie, come on", taking hold of the infant's hands. The infant does not respond. Her gaze seems to be directed towards the light on her left. (Obligatory attention.)

The mother then picks up the infant. They momentarily hold eye contact. She then places the infant over

her shoulder to wind it. After winding the infant she places her in the supine position on the table. The infant's head is now in the midline and gaze directed in the midline. The mother immediately leans forward smiling, an exaggerated smile, and intones in a high pitched voice, "therewa, therewa", moving her head slightly from side to side. The infant maintains eye contact during this exchange. The mother leans further forward, touches the child's cheek and says, "Come on", leans closer to the infant's face (now about 12 cms away), repeats this "Come on, come on". The infant begins a rhythmic pedalling movement involving hands and arms as she gazes fixedly at the mother's face. The mother again touches the child's cheek and says, "Come on, smile. Come on", and then backs away. The infant maintains her gaze in the direction of the mother's face and the mother, as if pulled, returns to the infant putting one hand on either side of the infant and repeats, "Come on, come on", as she bends down towards the infant, looming right over her. Mother repeats "Hullo" twice, touching the infant's chin. The infant responds again with pedalling movements of her arms and legs, opens her mouth in a smile, eyes are wide. The mother again verbalizes, "Come on", touches the infant's chin again. The infant, in a writhing movement, pushes herself slightly back, away from the mother, maintaining eye fixation and open mouth. The mother leans forward to get into the mirror plane again and says, "Hey, hullo". The infant opens her mouth wide, smiles, and then her head flops over towards the left and the mother moves away.

Obs. 2 - J 00:04:03

The mother is putting powder onto the infant's axilla. Julie has turned her head from the midline towards the

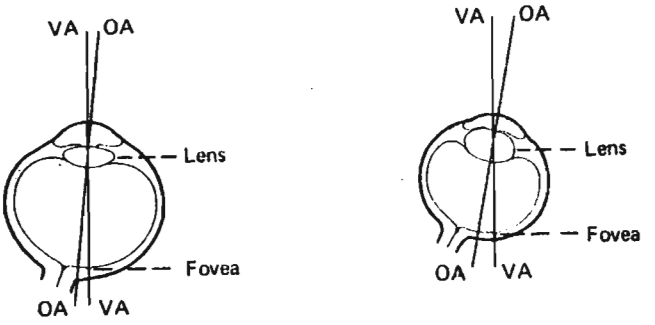
> left. The mother leans right over, bends down so that her face is directly in front of the infant's face, and says, "Come on, come on". The infant then, as the mother moves her head towards the midline, visually follows and turns her head, maintaining eye contact with the mother. The mother leans right forward, holding the infant under both arms, and says, "Are you a good girl?" This eye fixation is maintained. The mother stands back and then leans forward again, saying "Are you? Are you?" with a high intonation pattern. While the mother is talking, Julie pedals her arms. The mother repeats "Come on, kick", and grabs the infant's feet and moves them up and down a few times. The infant's gaze is then again diverted towards the left and the mother, after calling "Julie" once and holding the infant's hand, then says "allright" and goes back to the nappy changing.

It is evident then, from research and from this study that the constraints on the auditory capacities of the neonate do not, because of the nature of mother-infant interactions, detract from the quality of social interaction. The mother's sensitive reactions to the infant ensure optimal stimulation of the infant.

5.4.2 Visual Capacities and Object Localization.

The neonate is able to see light, dark, colour and has good visual acuity.

The pupillary reflex which is present at birth although rather sluggish, is fully functional within a few days. Visual pursuit is also evident in neonates although, as has been shown by Bower (1974), the infant below 20 weeks of age will continue to track even if the object becomes stationary. The implications for this rather bizarre behaviour are



OA = optic axis

VA = visual axis

ADULT EYE EYE AT BIRTH

Figure 3

Schematic diagram of adult eye and eye at birth, seen from above.

(Bower 1974, page 47)

allied to areas of cognitive ability specifically the concept of the object rather than to perceptual capacities. These implications can be followed up in Bower (1974). What is important for this research is that the infant's eye muscles are sufficiently co-ordinated to enable visual tracking and that this ability prolongs visual contact with specific objects and therefore interaction with the mother. It appears that the infant, because of the immaturity of the ciliary muscles, does not accommodate to objects at varying distances from its eyes but has a fixed focal length of approximately 20 cms. Accommodation reaches the adult ability at approximately four months of age. The nature of the most frequent interactions between mother and infant ensures that the immaturity of the infant's visual system does not prevent optimal stimulation by the mother. For example, whether breast or bottle feeding, the distance from the mother's to the infant's face averages 20 cms, also the social interchanges between them frequently

involve the mother positioning herself at approximately this distance. (See Obs 1 and 2, pages 39-41).

Experiments conducted by Fantz (1961, 1963, 1965) and others indicate that the infant is capable of detecting varied shapes and forms: some of the features of the visual stimulus that are likely to attract the attention of the infant have been isolated. During the first month of life stimuli that have a high degree of contrast and movement are most likely to attract and hold attention. The attraction of movement and contrast appears to be unlearned as it is evident within a few hours after birth (McCall & Kagan 1967). The human face is peculiarly suited to optimally attract the infant, it has a high degree of contrast and when interacting with her infant, the mother's tendency to make exaggerated mouth and eye movements and to nod or shake her head ensure that the visual stimulus is usually moving when in the infant's field of vision. In the older infant, from approximately four months, familiarity influences duration of regard. In an experiment conducted by Haaf & Bell (1967) four month old infants looked longer at a stimulus most similar to the human face, yet discrepant from the face with which they had become familiar. McCall & Kagan (1967) conclude from results obtained in a study similar to Haaf & Bell's that stimuli that are optimally discrepant from established schema are likely to attract and maintain attention. In both experiments the infants looked longer at the model most similar to the human face. Brennan, Ames & Moore (1966) testing infants aged three, eight and fourteen weeks found that the degree of complexity preferred depended upon age. There is thus an interaction between age and complexity preference. Establishing this has made it possible to reconcile results of studies which appeared to be conflicting, e.g. those of Spears (1964) and Hershenson (1964). It should also serve as a warning of the complexities of developmental research: one rejects maturational factors at one's peril!

In assessing whether or not the infant has three dimensional vision, looking times at stimuli depicting three dimensional as opposed to two dimensional stimuli were assessed. Looking time, also used in the experiments mentioned above, although not an entirely satisfactory

yardstick, is the best measure available. Polak, Emde & Spitz (1964) have shown that up to ten weeks of age infants will react similarly to two and three dimensional faces. By three months they will smile and vocalize more to the actual face than to a two dimensional representation of it. Fantz (1965) has shown that between two and three months there is a sudden increase in the time that the infant will spend looking at three as opposed to two dimensional models of the head. The ingenious depth perception experiments conducted by Gibson & Walk (1961) utilizing the 'visual cliff' have shown that by six months infants avoid the 'drop off' side even if an attempt is made to entice them onto it.

Bower (1974) in reviewing the evidence on radial localization by eye concludes that infants can identify radial direction during movement and even if, as in the case of auditory object localization, this localization is not precise, it would not impose a severe handicap on infants. All these experiments indicate that the infant's visual capacities are quite well developed at birth or develop fairly rapidly after birth. Fantz (1963) having tested infants from under 48 hours to six months concludes:

> "... the results ... demonstrate that pattern vision can be tested in newborn infants ... these and other results call for a revision of traditional views that the visual world of the infant is initially formless or chaotic and that we must learn to see configurations."
> (page 297)

To recapitulate, at birth the infant does have the capacity to 'see' a stimulus approximately 20 cms from its eyes and the features which attract its attention are present in the human face: for the purposes of this study, these are perhaps the most relevant findings.

The manner in which the visual and auditory systems interact has been studied by Aronson & Rosenbloom (1971) who have shown that infants as young as 30 days perceive auditory and visual information within a common space. Thirty days represented the lower age limit of their sample which does not therefore provide information to satisfy the nativist-empiricist argument. However, as noted by the authors even

if learning is to account for the auditory-visual spatial co-ordination, the learning process must necessarily be an extremely rapid and efficient one. This empiricist-nativist controversy is not relevant to this research: what is relevant is that from a very young age the infant does co-ordinate information from these two important perceptual modalities; information which would contribute to his attention on the mother and contribute therefore towards the focus of attention on eyes, mouth and sound, all necessary to the development of communication.

5.5 PRESSURE AND TOUCH SENSITIVITY.

These appear to be present from birth and contribute to the establishment of social contact between mother and infant. Tactile sensitivity varies according to the part of the infant's body being stimulated, with the peri-oral area being especially sensitive. Apart from facilitating feeding, the mother exploits this sensitivity by frequently touching and stroking the infant's mouth while looking at and talking to it; this is likely to prolong their interaction.

In summary it can be seen that human beings exhibit a number of features to which the infant pays selective attention, thus enhancing the development of social structures between them. Briefly these features are:

i) They are in almost constant movement.
ii) They emit highly varied stimulation.
iii) They stimulate a number of different sense modalities simultaneously.
iv) They present a complex, patterned, changing stimulus.
v) They are responsive to the infant's behaviour thus establishing reciprocal sequences.

However, the perceptual characteristics to which the infant is attracted are not confined to her parents or even to the species.

The human face is attractive to the infant because it possesses certain primitive attributes, not necessarily because the infant has an innate schema of face. In theory, inanimate objects could become the principal focus of the infant's attention but, because of the features listed above, this is unlikely to occur.

5.6 LEARNING ABILITIES OF THE INFANT.

"Any study of the development of knowledge which goes back to its roots ... has the merit of providing an answer to the yet unsolved question of the way in which cognition initially develops."

Piaget 1970a, page 191.

One of the major controversies in the area of the acquisition of knowledge has been that between the *nativists* and the *empiricists*. Nativists argue that human knowledge and human skill are built into the structure of the organism. On the other hand, empiricists state that human knowledge develops selectively out of specific encounters with certain environmental events.

These two extreme points of view are not explicitly supported by the majority of developmental researchers today, most pay at least lip service to some sort of interactional theory.

Piaget has always expounded and provided empirical support for an interactional theory of development. He states (1970b):

> "Knowledge, then, at its origin, neither arises from objects nor from the subject, but from interactions - at first inextricable - between the subject and those objects."
> (page 704)

This interactional perspective was adhered to in the analysis of the data to be presented. As it was found necessary to spell out the perceptual capacities of the neonate, so it is necessary to state the

learning capacities of the infant as these will determine the influence that *perceived* stimuli will have on the developing cognitive structures and the developing social structures of the infant and the mother-infant dyad respectively.

Bower (1974) argues that in infants, as a motivating factor, the schedule of reinforcement appears to be more important than the actual reinforcement. He suggests that this is because the schedule can pose problems to the infant and that problem solving is the most important motivator for human infants in the learning situation. The relevance of this seemingly unlikely form of motivation is evident in a number of experiments. Papousek (1969) showed that changing the contingency of reinforcement in the learned sequence: left head turn - light on to right head turn - light on or more complex variations, will result in a dramatic increase in the behaviour. The rate of activity will increase every time the contingency of reinforcement is changed: the infant appears to be testing hypotheses and trying out sequences of movement in order to discover which one operates at the moment. Interestingly, while the hypothesis testing is going on, the infant barely glances at the light (the reward).

> "It thus seems that the pleasures of problem solving are sufficient to motivate behavioural and mental activity in young infants. If the learning situation is interactive, the infant will demonstrate that he can learn; if the infant's only motive is the prospect of reward, then he will not demonstrate that he can learn." (Bower 1974, page 9)

This conclusion is also reached by Bruner (1974).

> "The play aspect of tool use (and indeed complex problem solving in general) is underlined by the animal's loss of interest in the goal of the act being performed and by its preoccupation with means ..." (page 25)

The interactional situation with the mother is a complex one, and can be seen as analogous to the 'problem solving' situation described above.

The mother's actions cannot be seen simply as regular reward contingencies. They are complex and irregular and serve the purpose of encouraging hypothesis formation and testing by the infant as the following example demonstrates.

Obs. 3 - J 00:07:05

Mother holds Julie in front of her gently patting her back. Infant's hand moves into her field of vision and she moves her head to maintain visual fixation on it. The mother immediately takes hold of the infant's hand and says: "There's your hand, there's your hand, look", holding the infant's hand up in the infant's field of vision.

"Can you see, can you see?", now holding infant's elbow, maintaining the fist in the infant's field of vision. Infant looks away. Mother recommences bottle feeding.

A few seconds later the infant again looks at her hand. This time the mother, without removing the teat from the infant's mouth, touches the infant's hand and says "There it is, there it is." The infant shows no apparent change in behaviour. A little later the infant's hand, during random movements, touches, and then closes on, the bottle. The mother immediately manoeuvres her hand so that it is touching the infant's hand and they jointly 'support' the bottle.

This short extract reveals the complexity of the interaction and that the mother carefully and skillfully establishes reinforcing

contingencies[1] for the infant's behaviours. The variation in these reinforcements could be seen to be posing the sort of problem referred to by Bower(1974) and would thus be prolonging the interaction and increasing the possibility of these behaviours appearing again.

That a problem solving schedule is highly reinforcing to the infant has obvious implications to an interactional model of development. As in the areas of the perceptual capacities of the infant, the type of interaction evident in the mother-infant pair appears to be peculiarly suited to the learning capacities of the infant.

Another interesting feature of the infant's learning capacities is the degree of complexity that is possible, for example Siqueland & Lipsitt (1966) trained infants of one day old to discriminate between a bell and buzzer by turning their heads in the appropriate direction. The order was then reversed and all of the infants were able to make the reversal with a facility unsurpassed by any nonhuman primate. The capacities enabling this sort of learning, stimulus identification, response identification, stimulus-response selection, in an infant as young as one day, must have developed without benefit of learning,

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[1] Watson (1972) has shown the pleasures to be derived from 'contingency awareness'. He supplied two month old infants with a mobile which they could activate themselves by means of sideways head movements on a special pillow. The infants responded to this experience with an excitement normally reserved for social interactions.

Schaffer (1977) gives an excellent account of 'mothering as stimulation' and concludes that mothers' talk is not merely a background noise but a form of stimulation particularly meant for the infant and so challenges him to respond.

> "... a mother can personalise the stimulation, ensuring that it connects up to the infant's internal state, his ability to attend, and his willingness to reciprocate." (page 65)

during the intrauterine period. Learning thus seems to depend on very elaborate mechanisms which are not themselves the product of learning but are related to the structure and functional nucleus of the organism. That these appear to be uniquely suited for stimulation of a social nature lends weight to the argument that the understanding of human development will come from a social analysis of infant behaviour and that the most fruitful approach will be to accept the mother-infant pair as the unit to be studied. This is the approach adopted by Bowlby (1969) with his postulation of a control system model to mother-infant behaviour. He asserts that an 'environment of adaptedness' exists for each species and for each system of each species.

> "Whilst all the instinctive systems of a species are so structured that as a rule they promote the survival of that species within its own environment of adaptedness, each system differs in regard to the particular part of that environment with which it is concerned. Some behavioural systems are so structured that they bring an organism into a certain kind of habitat and retain it there; others are so structured that they lead the organism to eat particular foodstuffs; and others again that they bring the organism into special relations with other members of its own species. On some occasions the relevant part of the environment is recognized by perception of some relatively simple character, such as a moving flash of light; far more often, however, recognition entails the perception of pattern."
> (Bowlby 1969, page 73)

Bowlby suggests that to understand mother-infant attachment it is best to see the two individuals as elements of one system. The goal of this system is to achieve and maintain proximity to each other. The period of infancy is one of great danger to the completely vulnerable infant therefore any behaviours which serve to bring the mother to its side and keep her there, will contribute to the survival of that infant. It can be assumed therefore that any system of the infant or mother favouring survival of the infant by maintaining proximity,

will, in terms of evolutionary theory, be selected[1].

5.6.1 Conclusion.

In conclusion, the intrinsic aspects of cognitive motivation, which is central to the acquisition of information and therefore cognitive development has been succinctly summarized by Flavell (1977):

> Simply ask yourself what a human cognitive system ought reasonably to be endowed with if it is to have a good chance of learning the enormous number and variety of things that members of our species do, in fact, routinely learn. If you, as evolution's architect, wanted to build an efficient, human-type knowledge-acquisition device, what sort of design would you adopt?
>
> It would seem sensible, first of all, to design it so that it did a lot of spontaneous, noninstrumental, intrinsically rather than extrinsically motivated cognitive functioning. The system should be disposed to notice and do and remember things even when no noncognitive needs (e.g., for food) are served thereby; it should exercise its schemes for the heck of it as well as for practical ends, for fun as well as for profit. There is so very much to learn that the system should not be permitted to lie around idle except when some tangible gain is in view.
>
> The cognitive system should also be biased to attend to those situations or features of situations that present it with the most information, and especially, information that is new and therefore worth learning. Thus, its attention ought to be captured more by the contours of objects (contours are effectively zones of light-dark contrast) than by their interiors, and more by moving objects than by still ones. Moving objects are obviously apt to be important ones to pay attention to (human beings being prime examples), and contour, of course, provides information about an object's shape and hence its identity. Even more adaptive in this respect, perhaps, is the system's

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[1] "The adaptedness of any biological structure be it morphological, physiological or behavioural, is seen as the resultant of natural selection's having, in a particular environment, led to the successful reproduction, and therefore preservation, of the more adapted variants, and simultaneously to the less successful reproduction, and therefore dropping out, of the less adapted variants."
(Bowlby 1969, page 81)

> marked responsiveness to those relative, child-times-stimulus type properties mentioned earlier. Novel, surprising, puzzling, discrepant, uncertainty- and curiosity-provoking, or put most generally, not-readily-assimilable happenings - these are precisely the ones a learning, developing organism *ought* to be designed to notice, explore, and seek to understand, for they constitute the essential nutriments for its cognitive progress.
>
> Needless to say, the cognitive system should be amply rewarded for its successful efforts at understanding such happenings, i.e. for the bit of learning and cognitive development it has achieved, and so we provide it with a purely cognitive kind of pleasure and sense of satisfaction whenever understanding dawns. We shall also want to make the system take pleasure in rehearsing its newly developed competence again and again, by itself and on its own. Such rehearsal for mastery's sake will tend to solidify and stabilize this competence through the overlearning it provides.
>
> In sum, we have designed an organism that idly learns when there is no practical need to do so, that tries to learn what it most needs to learn, and that finds it rewarding both to learn these things initially and also to solidify and perfect its learning through subsequent practice. The human child appears to be just such an organism. (pages 23, 24)

5.7 HOW SOCIAL IS THE INFANT AT BIRTH?

Schaffer (1971) and Ainsworth (1974) offer what appear to be diametrically opposed points of view on the nature of the infant at birth. Schaffer states:

> "At birth an infant is essentially an *asocial* being. He has as yet no orientation to other people as such; ... his means of communication are limited in range and egocentric in nature."
> (page 13)

Ainsworth, however, asserts the contrary:

> "A child is pre-adapted to a social world, and in this

> sense is *social* from the beginning."
> (page 99)

The contradiction between Schaffer and Ainsworth is not a trivial one. If one adopts the latter's view the socialization of the infant is more of a maturational (intrinsic) than an interactional process. All that remains for the developmental psychologist is to describe the changes that occur. However, adopting the former view compels one to seek for the interaction of processes both extrinsic and intrinsic to the infant which contribute to socialization and to incorporate these into an explanatory framework compatible with the complex development[1] which takes place during infancy.

Richards (1974c) perhaps provides a resolution to this contradiction:

> "Though in many respects one may regard an infant as a presocial being, he is not fully social as he is not yet a competent member of a social community. Rather, he is a biological organism with biological propensities and organization who *becomes* social through his encounters with social adults."
> (page 1)

It does not seem valid to regard biological predisposition as sufficient grounds for inferring sociability. Richards (1974c), in a thought-provoking introduction to *The Integration of a Child into a Social World*, states:

> "Our task in the analysis of socialization is to describe, and explain, the process by which the single cell that is formed at conception develops into a recognizable human who can live among and communicate with the fellow members of his society: so we are concerned with the development of ... the skills necessary to take any part in human life."
> (page 7)

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[1] Development is being used here in its broadest sense and includes cognitive, social, affective and physical aspects of change.

Earlier he lists these as the powers of speech, of consciousness, the ability to form social relationships and of self reflection.

It would seem to be attributing capacities to the infant which are not known to be present, to assert that he is social at birth. Piaget (1968), quoted in Radford & Burton (1974) states explicitly that there are *no* innate structures in the infant. Although dealing with intelligence, Piaget's interpretation of this concept is so broad that this statement has direct relevance to the above argument: if one accepts the proposed extension of Piaget's theory then the position this statement forces one to adopt towards the infant is clear.

> "The clearest result of our research on the psychology of intelligence is that even the structures most necessary to the adult mind ... are not innate to the child; they are built up little by little ... there are no innate structures: every structure presupposes a construction."
> (Piaget, quoted in Radford & Burton 1974, page 180)

But that the infant is uniquely adapted to develop into a social being has been confirmed in numerous studies, some of which have been referred to.

For the purposes of this study the assumption that the infant is asocial at birth is accepted and the way in which sociability is established is a central concern. Sociability implies communication; thus in studying the development of communicative skills one is studying the translation of this biological predisposition into reality, that is one is studying socialization. Ryan (1974) states:

> "The process of acquiring language in itself constitutes a form of socialization. This is particularly true of the very earliest stages of development when the child first comes to participate in dialogues with others ..."
> (page 185)

Richards (1974c) makes the stronger claim that:

> "..the essence of socialization becomes communication, for it is only insofar as the adults perceive and understand an infant's needs that these can be met ..." (page 1)

And in another paper (1974a) he rejects the terms attachment and attachment behaviour (Ainsworth 1969, Bowlby 1969) which he replaces with communication because

> "...the latter (attachment and attachment behaviour) are unduly restrictive and cannot easily be used as a basis for the discussion of the range and subtlety of the infant's relationships ..." (page 119)

Richards thus interprets the concept of communication very broadly: an interpretation similar to the one being adopted here. Richards (1974c) argues for an interactive approach between the biological and social. However, he does not provide an account of how this rapprochement is to be achieved. Piaget in *Biology and Knowledge* (1971) has gone some way towards providing a theoretical solution to this dichotomy. Furth (1974) provides a clear interpretation of Piaget's argument:

> "In conclusion, two distinctions are suggested, ... first, there is the difference between a particular observable behavior and its underlying organizational structures; these behavioral mechanisms must always be conceptualized as internal to the organism and not simply be identified with physiological structures. Second, there is the difference between an experience that derives primarily from the actions of the organism in a common, normal environment, and one that derives primarily from particular environmental contingencies. Development in the strict sense would then refer to the acquisition of general behavioral structures during ontogeny. This acquisition is species-specific, hence also species-adaptive, and takes place in a mutual dialectic interaction between what is species-common within the individual organism and in the environment. This interaction has been called here "species experience". Ontogenetic learning in the strict sense would refer to a particular application of the individual's behavioral structures to a particular environment. This aspect of the interaction of organism has been called here "particular experience"." (page 65)

This research is concerned both with species experience (the socialization of the infant and the acquisition of language) and with particular experience (the particulars and idiosyncracies acquired by each infant through its unique experiences). The 'underlying organizational structures' are, for the purposes of this research, taken as given. They have been touched on only insofar as they relate to the infant's learning capacities and perception of the world.

6.0 THEORETICAL FOUNDATIONS.

"The Chinese character for thinking combines the character for head and the character for heart. It is a pity it does not also include the character for others ..."

Bruner 1974b, page 14

6.1 THE CONTRIBUTION OF THE GENEVAN SCHOOL.

The period of development covered by this investigation is the first two years of life, the period Piaget calls the sensori-motor period. Within this period Piaget demarcates six stages, however it is important to note that although this developmental period is being divided into stages each stage develops out of and incorporates the previous stage. The processes of development are therefore in some sense continuous. The term 'processes of development' derives from Piaget's biological orientation to development. (See for example Piaget 1953, 1971.) The most general principles are:

i) Behaviour is an interaction between organism and environment.

ii) Any living organism is organized and its organization continually changes in order to adapt to its environment. Furthermore, no organization has a zero starting point from which it can definitely be said to begin, rather, each stage is essentially a development from a preceding one, incorporating and superseding it.

iii) Any living organism has certain intrinsic properties which can be demonstrated at all levels of biology. These are that it

> "... tends to conserve its own structure and, at the same time extends the application of its structure to include as much of the milieu as it can."
> (Furth 1969, page 18)

iv) Organization and adaptation are fundamental features of development and apply to both biological and cognitive functioning.

6.2 LANGUAGE FROM THE PERSPECTIVE OF THE GENEVAN SCHOOL.

Before elaborating on some of these concepts it is necessary to discuss the position of language in Piaget's theory. According to Piaget (1952, 1953) and Piaget & Inhelder (1969) language is only one manifestation of the symbolic or representative function; others are mental imagery, symbolic play, gestures and drawing. Sinclair (1973) working within the Piagetian frame of reference asserts that language occupies a place apart from the other symbolic functions in that it is a conventional system which has evolved over time and that it is a highly structured system where elements are combined according to intricate rules. In other symbolic activities the subject can invent his own rules. However, if communication is to take place there must be *agreement* between the participants as to the meanings of the symbols or signs[1] and the rules which relate them to each other. In communication between the mother and infant one can trace the development of communicative actions and rules: many of the rules, because they are fundamental to communication in any form, viz. reciprocity, are continued into language use.

The representative function is necessary but not sufficient for the appearance of language; various social and cognitive skills must also be present. Piaget (1969) traces the development of representation through several stages of imitation. The weight which imitation carries in Piaget's account of the development of representation reflects the individual or asocial bias of his developmental theory. This bias is especially limiting in the sensori-motor period where the majority of the infant's waking time is spent in interaction with caretakers. Newson & Newson (1975) state:

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[1] Piaget (1969) distinguishes between signs and symbols. Symbols are related in some way to the signified e.g.  would be the symbol of a house; whereas signs are related to the signified arbitrarily and through social conventions e.g. 'house' is a sign of a house. Language is therefore predominantly a system of signs.

> "... we would not quarrel at all with his (Piaget's) proposition that 'objective knowledge is not acquired by a mere recording of external information but has its origins in interactions between the subject and objects ...' To this statement we merely wish to add that the object with which the human infant interacts most often, and most effectively, particularly in the earliest stages of development, is almost invariably another human being ... To align Piaget's position with our own it is necessary to enlarge the concept of 'object' to include human beings."
> (page 437)

The extension of Piaget's object concept to include human beings goes some way towards correcting the asocial bias of Piaget's theory: however, it does not go far enough. The implication is still one of development intrinsic to the infant. By extending 'object' to include 'social objects' the latter is reduced to the status of the former and the property of 'actor' is denied the social object. It therefore does not place sufficient emphasis on the active *interaction* processes themselves and the evolution out of these of 'social structures'[1] shared between members of the interacting dyad. Interaction with an active agent differs from interaction with the natural world in that the former has properties of self-initiated activities.

To briefly summarize the modified Piagetian perspective on language which this text adopts:

(a) Language is *one* form of communication. The latter is not dependent upon the former but is facilitated by it.

(b) Communication (which may include language) involves a number of skills which are social and cognitive in nature. Language as a system, by its nature, can exist (in written form) without these skills although it has evolved out of them. The proliferation of the written

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[1] The nature and development of social structures is discussed in 9.2.

word (which appeared very late in man's history) has contributed to the view of language as an object which can be studied out of the social context and independent of its use, a view evident in the works of Chomsky and many other linguists. But communication is a social phenomenon which has its origins in social interactions. It is a process far more encompassing than language. For these reasons this study does not limit itself to the concepts Piaget utilizes in his discussions on the semiotic or symbolic function, rather it regards the *entire* social development as relevant to the development of communicative competence.

6.3 THE CENTRAL CONCEPTS.

"Most of what humans respond to in the so-called real world has this property: without a structural description of the cognitive organization in the minds of the participants in an action, one cannot even locate, still less define the stimulus."

Bruner 1976, page 1589.

The distinction between cognition and communication is difficult to make: nothing can be communicated that has not been cognized although cognitive activity can continue without communication. Because of this interrelatedness many of the features of the one system are applicable to the other. In what follows the concepts from Piaget's theory which will be used in the analysis of this data will be defined and their areas of applicability specified.

As has already been mentioned, Piaget has largely ignored the social aspect of cognitive development and it is therefore in this domain that the majority of modifications to his theory were necessary. As anyone who has struggled with the complexities of Piaget's writings will appreciate, interpretation of his concepts is not merely coming to terms with a single definition but familiarizing oneself with his use of these theoretical constructs in different contexts: each one

contributing to a clearer understanding of the 'sense'[1] of the term and its interrelatedness to the other aspects of his theory of cognitive development. Not one of these concepts can be understood in isolation from the theory as a whole. As stated by Bower (1974):

> "Piaget has described the processes and details of infant cognitive development in his famous trilogy *The Origin of Intelligence in Children* (1936, trans. 1953), *The Construction of Reality in the Child* (1937, trans. 1954) and *Play, Dreams and Imitation in Children* (1946, trans. 1951). The breadth and originality of these works dwarfs all of the other essays in this field. It would be impossible to summarize these books ... Indeed they depend on an interplay between observation and theory that defies summarization."
> (page 181)

6.3.1 Structure and Function.

In *The Origin of Intelligence in the Child* (1953) Piaget states:

> "Verbal or cogitative intelligence is based on practical or sensorimotor intelligence which in turn depends on the acquired and recombined habits and associations. These presuppose, furthermore, the system of reflexes whose connections with the

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[1] Sense = "Sum of all the psychological events aroused in our consciousness by the word. It is a dynamic, fluid, complex whole which has several zones of unequal stability." Vygotsky (1962, page 146) attributed to Paulhan. Frege (1952, page 2) distinguished between 'sense' and 'reference'. The sense provides the 'mode of presentation' of the object and referring to a reference is always achieved by way of sense. Frege's use of sense is therefore similar to that of Vygotsky.

Sense can also be seen as the relationship of a term (sentence) with other concepts of the language.

> organism's anatomical and morphological structure[1] is apparent. A certain continuity exists, therefore, between intelligence and the purely biological processes of morphogenesis and adaptation to the environment."
> (page 1)

Piaget makes an important distinction between the hereditary factors of intelligence which he regards as genetically given features of the brain which are essentially limiting and the inheritance of functions of the mind:

> "If there truly in fact exists a functional nucleus of the intellectual organization which comes from the biological organization in its most general aspect, it is apparent that this invariant will orient the whole of the successive structures[2] which the mind will then work out in its contact with reality, ... it will impose on the structures certain necessary and irreducible conditions."
> (Piaget 1953, pages 2 ff)

If one accepts the interrelationship between intellectual functioning and communication it is permissible to ask the following questions:

(1) What is the functional nucleus of communication?

(2) How does it relate to the biological organization?

(3) How will this influence the 'successive structures which the mind will work out in its contact with reality'?

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[1] Structure here refers to anatomical structure.

[2] 'Structure' here and elsewhere in this work refers, unless otherwise stated, to psychological structures and not to anatomical or given features of the brain. These structures are inferred organizational properties of intellectual functioning. They are not directly observable but underlie the behaviour that is observed.

An attempt will be made to answer the three questions posed, the emphasis being on communication in the preverbal period.

6.3.1.1 What is the functional nucleus of communication?

It would seem that one of the fundamental features of successful communication is the establishment of co-ordinations between two or more individuals, A and B. This implies that once a co-ordination has been established, A is aware of what B will do in a certain situation *and* B knows that A knows. In other words they share an agreement about proceeding. Bennett (1976) refers to this shared agreement as a *convention* which he defines thus:

> "A convention, then, is a behavioural regularity which a community maintains because they mutually know that they have maintained it in the past and that it has solved for them a recurring kind of co-ordination problem."
> (page 177)

The reciprocal action of mutual visual attention in the second stage[1] of the development of communicative competence is a necessary step towards the achievement of visual co-ordinations. Until stage IV[2] there are no behavioural criteria in the infant's repertoire which enable one to infer that co-ordinations are present. Initially alternating attention patterns can only be interpreted as reciprocal actions, after stage IV some of these can be interpreted as co-ordinations. An example of reciprocal action is

A acts	B attends
B acts	A attends.

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[1] These stages are discussed in detail in Section II. The second stage, which commences within two weeks after birth and extends to approximately nineteen weeks involves long periods of mutual visual regard. During these periods the mother is very active in maintaining the infant's visual attention on herself.

[2] Stage IV involves alternating gaze patterns of both the mother and the infant on each other and a specific object.

The attention need not imply that the attender and the actor mutually know this sequence. When this mutual knowledge is present as for example in a conversation, co-ordinations can be said to exist. Where mother and infant jointly and spontaneously initiate co-operative actions to complete a task, co-ordinations can be said to be present.

In mother-infant interactions the mother adjusts her behaviour to interrelate with that of her infant, thus imposing a reciprocal status on their interactions. It is out of these that co-ordinations develop. An example of this reciprocal behaviour follows.

Obs. 4 - S 00:23:05

Infant: Sitting on Mother's knee holding plastic duck in her right hand, looking at it.
Mother: Looking at Infant.
Infant: Vocalizes, looks towards her right hand.
Mother: Removes duck - puts it on floor. Lifts Infant into a standing position, kisses her cheek.
Infant: Turns slightly and looks at object on the floor.
Mother: Looks from Infant's face to follow her line of regard. Picks up teddy bear - holds it in front of the Infant. "Look, there's your teddy bear."
Infant: Looks at bear, reaches towards it, grasps it.
Mother: Releases bear and it falls to the floor.

In following the infant's gaze and retrieving then presenting the object at which the infant was gazing, the mother is acting as a means by which the infant obtains her goal. The infant's behaviour could be classified as a protoimperative[1]. This, and the mother immediately

[1] A Protoimperative is "... the insertion of the adult as a means to attaining objects or other goals." (Bates 1976, page 51)

releasing the object once the infant has hold of it, are examples of co-ordinations developing between them.

Communication, of a sort, is present in the mother-infant dyad from the first interaction. However, initially it is the mother, a skilled communicator, who is communicating with her infant and interpreting behaviours of the infant as if they were communications from the infant. The infant does not have the skills either to interpret the mother's messages or to send messages itself. These are the skills which develop during the preverbal period out of joint action sequences. It is these early skills, many of which are in fact rules of interaction, which comprise the functional nucleus which will "orient the whole of the successive structures (of communication viz. language)". Language in use depends upon the communicative competence established in the preverbal period.

To summarize, three of the skills essential for communication which are acquired by the infant during early interaction with the mother are

(1) Reciprocity of action.

(2) Joint attention.

(3) The development of co-ordinations.

6.3.1.2 How does the functional nucleus relate to biological organization?

This question is dealt with indirectly in the section on the capacities of the infant. It is necessary to integrate the information dealing with the infant's capacities with the model of communicative development being presented here.

6.3.1.2.a *The asymmetrical dyad of mother and infant.*

Communication is a social behaviour, its evolution must be studied in

a social context. In this research the mother and infant were regarded as *one* system. It was assumed that their integrated skills enabled communication to develop between them. Viewing either of them in isolation enabled only quantitative information to be accumulated thus preventing an understanding of the qualitative transitions in the form of functioning which takes place during the development of communication.

The mother is obviously the more skilled element in the system, she is a skilled social operator. The infant, on the other hand, has few social skills (none at birth) and very limited communicative ability. The mother, as the more sophisticated partner, imposes a structure on their interactions, complementing and encouraging the infant in its social and other endeavours. This can be schematically represented:

	Infant A		Mother B
1.	Asocial	----------	Social: Acts as if A is social.
2.	Non-intentional	----------	Intentional: Acts as if A has intentions.
3.	Displays reflex behaviours not actions	--------	Skilled actor: Acts as if the reflex behaviours of A are actions[1].
4.	Behaviour is adualistic[2]	----------	Is fully aware of the distinction between self and other and behaves towards the infant as if the infant has this awareness.

[1] Actions imply intention and awareness.

[2] Baldwin's sense of the term - quoted in Piaget 1953:

> "Adualism in which there does not yet exist any consciousness of the self; that is any boundary between the internal or experienced world and the world of external realities." (page 22)

Looking at a neonate in a detached and 'objective' manner, no serious student of development would regard its behaviour as intentional. In terms of the Speech Act theory proposed by Searle (1969) and extended to pre-speech behaviour by Dore (1973a, 1973b) the neonate's behaviour could not be regarded as communicative. However, the mother (and other caretakers, including developmental psychologists) in the social situation, act towards the child *as if* the child already has the ability to communicate intentionally. This presents certain problems. In studying the mother-infant dyad as a unit (which has been proposed here to be the only way of studying the development of language) does one regard the movements of the infant only as movements or does one interpret them, as the mother does, as actions? It is in this latter sense that they are influencing the behaviour of the unit of study and therefore it is this latter interpretation which was utilized in the analysis of this research data[1]. The relevance of the mother's interpretations to the development of both the shared social structures and the individual cognitive structures of the infant cannot be overestimated. The consistent and therefore predictable reactions of the mother facilitate the development of both the intra and inter individual structures.

To summarize, the infant cannot yet communicate, the mother is a skilled communicator who, for most of the time behaves as if the infant is competent in communicating. It can be seen that the mother's behaviour compensates for the infant's lack of social skills; the infant however has certain innate attentional and perceptual attributes (i.e. biological organizations) which facilitate the establishment of the functional nucleus of communication. The infant cannot survive without intensive adult care: its biological nature and that of its caretakers ensures that there is frequent adult-infant interaction of a specific kind e.g. feeding and cleansing. It is out of these social interactions that the functional nucleus of communication develops. In any situation involving infant and adult the two

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[1] It seems as if the mother attributes intentional action to movements which later are to become the actions she attributes, thus anticipating the infant's development of action.

individuals will be operating on different functional levels. However the mother's skill in relating her actions to suit the capacities of her infant reduces the significance of this distance and facilitates the acquisition of communicative competence.

6.3.1.3 How will this influence the successive structures that the mind will work out in its contact with reality?[1]

The biological structures influencing the content and form of the communicative acts although permitting fairly wide variation between different mother-infant pairs will ensure that these are confined within certain limits. Because these limits are species-specific and because communication is prior and is being regarded as the 'functional nucleus' they will impose on the structures which develop (both individual and social) certain necessary and irreducible conditions. As these will apply to the development of language in general the structural similarities (which arise out of the functional nucleus) of different natural languages can be accounted for in part.

The structure of language no matter how elaborate is always confined within the rules, both social and syntactical. What is being suggested is the primacy of communication (social rules) and a continuity between these and language. This view removes the relevance of an innate language acquisition device to account for the development of syntax. Searle (1976) states:

> "Chomsky believes that the rules of syntax of natural languages, that is the rules of sentence construction, can be stated using only syntactical notions: the rules, for him, make no reference to meaning or function or any other non-syntactical notion: all the rules of syntax of all natural languages are in this sense

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[1] It is inevitable that discussion of this question will lead into areas apparently remote from the immediate question. Some of these, e.g. presuppositions, the Fregean core, are dealt with here. Others, e.g. rules and conventions, are dealt with in more detail later.

> formal ... If, as seems probable, language evolved in human prehistory to serve certain needs of communication, it is likely both that there will be some rules that make reference to the communicative functions of language and to the meanings of syntactical elements, and that many of the purely syntactical rules of language will have a deeper explanation in terms of the functions that the syntactical forms serve."
> (page 1119)

It seems extremely limiting to exclude, *a priori*, the more embracing explanations suggested by Searle in favour of the purely structural one followed by Chomsky. The argument for the functional relevance of syntactical rules has, intuitively, great credibility. The empirical support for functional relevance is evident in the data reported in Section II. Accepting the relevance of functional features of communication to syntax demands that the study of language begin in the preverbal period when these functions begin to appear.

The primacy of communication also has implications for a central claim in Frege's (1952) theory of language. This can be summarized as follows:

> "A large number of sentences of a natural language can be understood by a competent speaker-hearer without knowing who said the sentence, where, when, why, etc."
> (Moravcsik 1975, page 21)

This reflects the dual notion of language i.e. that of a structured system which exists apart from any individual but which, also, has been created in use by communicating individuals who require socialization into the system to become competent speaker-hearers. What Sinclair-de Zwart (1973) refers to as the conventional nature of language. But, if one accepts the necessity of socialization into the language system then one is compelled to accept the relevance of the preverbal period of communication to language and, with Kaplan (1973) and Kripke (1971) to question the size, certainly in early language, of what has come to be known as the Fregean Core. Without the establishment of a system

of 'mutual implications' and 'interconnected meanings' it is doubtful whether any sentence *in isolation* can be understood unambiguously by any competent speaker-hearer.

These systems of mutual implications and interconnected meanings are analogous to pragmatic presuppositions as outlined by Stalnaker (1975) and by Bates (1976). Bates asserts that

> "Insofar as pragmatic presuppositions vary according to the context and the beliefs of the interlocutors, they cannot be defined by reference to the sentence alone ... (they) are conditions which are necessary for a sentence to be appropriate in a given context. Therefore, by definition, Pragmatic presuppositions are the property of speakers."
> (page 24)

Stalnaker (1975) elucidates the relevance of the distinction between semantic and pragmatic presuppositions. Stated at its simplest, with semantic presuppositions the presupposition relation can be explained solely in terms of the meaning or content of sentences, whereas with the notion of pragmatic presuppositions the basic presupposition relation is not between propositions or sentences, but between a person and a proposition.

> "A person's presuppositions are the propositions whose truth he takes for granted, often unconsciously, in a conversation, an inquiry, or a deliberation. They are the background assumptions ... This background of knowledge or beliefs purportedly shared by the speaker and his audience constitute the presuppositions which define the context."
> (Stalnaker 1975, pages 31, 32)

6.3.2 The Functional Invariants: Adaptation and Organization.

The concepts of organization and adaptation reflect the same theoretical distinction as structure and function but on a less general level. Structure and function can refer to any system whereas organization and adaptation refer to biological systems interacting with their

environments. It is inevitable therefore that discussion of adaptation and organization will include discussion of structure and function.

The concepts of adaptation and organization are central to Piaget's theory and in their application to cognition do not differ from their application in biology. These two processes although distinguishable theoretically are, in practice, inseparable.

> "Organization is inseparable from adaptation: they are two complementary processes of a single mechanism, the first being the internal aspect of the cycle of which adaptation constitutes the external aspect."
> (Piaget 1953, page 7)

6.3.2.1 Adaptation.

The process of adaptation will be discussed first.

> "There is adaptation when the organism is transformed by the environment and when this variation results in an increase in the interchanges between the environment and itself which are favourable to its preservation."
> (Piaget 1953, page 5)

Piaget has failed to make the important distinction between the two processes of adaptation in progress, that of adaptation to the natural world and that of adaptation to the social world: these processes are interdependent. In the infant these two worlds are separate from each other and cannot be related but gradually during the first few months of life the infant begins to relate one to the other. Behaviourally this is evident in the developing interactional skills of the infant which, through the process of reciprocal assimilation (see 6.3.2.3.b) permit schemes of 'attention on object' and 'attention on mother' to combine to form the more complex scheme of alternating attention between object and mother maintaining the phatic link with the mother even when not attending directly to her[1].

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[1] The developmental sequence is presented in Section II.

According to Piaget organization and adaptation are inseparable, however adaptation can be viewed more as a process and organization as a system of relationships. Adaptation itself can theoretically be seen as consisting of two parts, that of assimilation and that of accommodation. This distinction is possible only in terms of the level of functioning of the process, for example if a stimulus can be taken directly into the organized system without any adjustments to the system being necessary, this is termed assimilation, however if the stimulus is discrepant and cannot be assimilated without the system changing in some way, this is termed accommodation. To quote Piaget:

> "... assimilation is the integration of external elements into evolving or completed structures of an organism."
> (1970, page 707)

This can be represented thus: $(T + I) \longrightarrow AT + E$

T = structure
I = integrated substances or energies
E = eliminated substances or energies
A = coefficient 1 expressing the strengthening of T in the form of an increase of material or efficiency in operation[1].

At some point, however, if I is outside the range of assimilation, a change in T will be necessary and it is at this point that accommodation enters the equation. It must be emphasized that if an event or object could not be assimilated it would *not* represent a biological stimulus: it would simply not exist for that organism. In fact all instances of adaptation represent a balance between assimilation and accommodation.

> "... we shall call accommodation any modification of an assimilatory scheme or structure by the elements it assimilates."
> (Piaget 1970, page 708)

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[1] From Piaget 1970.

When assimilation and accommodation are in a state of equilibrium, adaptation is present.

6.3.2.2 Organization.

The concept of *organization* has been implicit in what has preceded. Adaptation implies an organized system. Piaget (1953) states it thus:

> "Concerning the relationship between the parts and the whole which determine the organization ... every intellectual operation is always related to all the others and its own elements are controlled by this same law. Every schema[1] is thus co-ordinated with all the other schemata and itself constitutes a totality with differentiated parts. Every act of intelligence presupposes a system of mutual implications and interconnected meanings."
> (page 7)

If 'act of intelligence' were to read 'act of communication' this fundamental concept can be directly transferred to the social context.

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[1] The term 'schema' was proposed by Head (1926) as a neurological construct and elaborated on by Bartlett (1932) as a phenomenon of memory. Piaget has established the concept as a fundamental cognitive unit (tool).
Piaget (1953):

> The schema ..."constitutes a sort of sensorimotor concept, or more broadly, the motor equivalent of a system of relations and classes. The history and description of a schema therefore consist primarily in its generalization, through application to increasingly varied circumstances."
> (page 385)

Schemas and concepts are therefore the tools one employs in adapting to the world.

In studying the development of communication, what we are studying is the development of these 'mutual implications' and 'interconnected meanings' in the organization between individuals (viz. the Social Structures). (As used by Piaget the 'mutual implications' and 'interconnected meanings' refer only to the organization *within* an individual.) These 'social structures' are thus the property of neither of the actors individually but depend upon their reciprocal co-operation (co-ordinations) and shared agreements about the world if they are to be functional, for example while A talks, B must listen if the system is to function. If B does not listen then A's action has served no communicative function, that is there has been a lack of co-ordination. Conventions require knowledge of the other, that is X must 'mean' the same thing to both infant and mother for it to be a convention.

6.3.2.3 The processes of assimilation.

6.3.2.3.a *Generalizing assimilation.*

Different types of assimilation can be recognized: these have been elaborated by Piaget in the context of assimilation to the cognitive structures within an individual. It is suggested that these concepts apply equally to the social structures outlined in 9.2. The types of assimilation will be defined and the interactional situation to which they could apply will be briefly reported.

> "*Generalizing assimilation* ... is ... the incorporation of increasingly varied objects into the (reflex) schema."
> (Piaget 1953, page 34)

This generalizing assimilation does not necessarily imply that the infant initially distinguishes a particular object. The sucking reflex is generalized by the infant to include such objects as the breast, bottle, thumb, etc. Some of these objects may be introduced by the mother, for example she places the nipple or bottle into the infant's mouth, others enter through the infant's own actions. In the

interactional situation the mother encourages the process of generalization of scheme for example by extending the 'looking at her' to looking at objects; by involving the infant in a number of similar interactional situations all of which contribute to the establishment of features fundamental to communication for example reciprocal turn taking or attention on the partner during the partner's action. An example of this generalization is the development of a routine between mother and infant of mother vocalizing in a stereotyped manner and approaching and withdrawing from the infant and then waiting for a laugh/smile from the infant. On another occasion the situation may be one of bouncing the infant up and down and then waiting for a response. The initiative for the generalizations comes originally from the mother but later may come from the infant. Because the structure exists between the two interacting individuals the locus of initiation of an action may be the prerogative of either of them.

6.3.2.3.b *Reciprocal assimilation.*

The other type of assimilation which is relevant to this study is that of reciprocal assimilation, in which one scheme is assimilated to another scheme. For example the scheme of looking is assimilated to the scheme of reaching thus enabling visually directed reaching to emerge as a more complex behaviour than either of the two individual schemes. This reciprocal assimilation differs in an important respect from Bruner's (1974) concept of modularization. For Bruner the incorporation of a less complex into a more complex behaviour is the result of the freeing of organizational pathways in the brain. For example, when learning to walk the infant's entire attention is focussed on maintaining balance and moving towards a goal, later however, walking requires no conscious monitoring and the organizing capacities of the brain can be employed elsewhere and walking will be incorporated into various other behaviour patterns. However reciprocal assimilation implies that the conjunction of the two schemas to form a third is an *active* process developing out of the infant's activity on the world.

The concept of reciprocal assimilation developed by Piaget can be extended to include processes of interaction. For example, when objects are introduced the schemas of looking at partner and looking at object have to be reciprocally assimilated if communication, to the partner, about the object is to be possible. This skill is of course present in the mother in her interactions with others but not yet, because of the limitations of the infant, present in the interactions with her young infant. Here again, as one would expect, the mother takes the initiative and actively encourages her infant towards the acquisition of this skill of initially alternating gaze and later of maintaining social contact with either gaze alternation or vocalizations.

6.3.3 Representation.

For Piaget, the appearance of representation marks the end of the sensorimotor period and the transition from 'intelligence in action' to symbolic intelligence.

> "(Representation) consists in the ability to represent something (a signified something: object, event, conceptual scheme, etc.) by means of a 'signifier' which is differentiated and which serves only a representative purpose: language, mental image, symbolic gesture, and so on."
> (Piaget & Inhelder 1969, page 81)

These signifiers may be, according to Piaget, either signs which bear an intrinsic relationship to that which they signify, e.g.  = house, or symbols which bear an arbitrary relationship to that which they signify, e.g.'house'= house. In language these symbols are conventional and cannot be deviated from too widely if understanding between the interacting individuals is to be ensured. These shared meanings reflect an intersubjectivity.

Peirce (1932) in his theory of semiotics distinguishes three kinds of signs.

1. Icons: signs that are related to the things they stand for by virtue of some direct physical resemblance, e.g. international road signs.

2. Indices: signs that are related to the thing they stand for because they are part of the event or object, e.g. smoke indexes fire, the mother removing the infant's clothes indexes bath time. (Piaget's term 'significations' (6.3.4) appears to be synonymous with Peirce's 'indices'.)

3. Symbols: signs that are related to the things they stand for by an arbitary bond *agreed* upon by those who use the symbol. This last category would be the last to appear ontogenetically.

Silverstein (quoted in Bates 1976) stresses that both symbols and icons can be described within a semantic-syntactic system, which specifies the relation between the sign and the referent independent of the use of some speaker. This is not so for *indices* where a context is a prerequisite (see Bates 1976 for an elaboration of this). In the acquisition of signs it would seem that indices are the first to appear. In the interactions between mother and infant, for example the verbal games (page 83) the 'surprize' or 'waiting' behaviour shown by the infant at the hesitation in completion of the sequence is evidence of this. The element of the round which preceded the anticipatory behaviour is the index for the concluding element.

In Piaget's theory, representation develops during the sensorimotor period and is evident at about eighteen months i.e. in stage 6 of the sensorimotor period. Representation must therefore have, like all other cognitive skills, its origin in the reflexes of the neonate, the development beyond this stage being due to the functions of adaptation and organization. Piaget recognizes imitation as being of fundamental importance to the development of representation.

While accepting the importance of this behaviour it is suggested that in the interactions of the mother and infant, games and skills which do

not involve imitation are being taught which facilitate and probably are necessary for the eventual separation of signifier from signified, i.e. representation[1]. Examples of these appear in the data.

Piaget denies the existence of representation in the sensorimotor period.

> "The sensorimotor mechanisms are pre-representational and behaviour based on the evocation of an absent object is not observed until during the second year." (Piaget & Inhelder 1969, page 52)

However this does not deny the presence of thought or communication in the pre-representational period. Thought is evident in the child's actions on the world, and communication in the child's interactions with the social world.

Development towards representation involves three types of significations, which succeed each other and are evidence of increasingly complex cognitive and social functioning.

6.3.4 Significations.

In the sensorimotor period the infant uses 'significations' which are perceptual and are by definition indicators in that they constitute an aspect of the signified.

> "In a general way we shall call indication every sensory impression or directly perceived quality where signification (the 'signified') is an object or a sensorimotor schema ... an indication is a perceptible fact which announces the presence of an object or the imminence of an event." (Piaget 1953, pages 191, 192)

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[1] See Furth (1971) for an outline of Piaget's theory of representation and how it differs from other theories of representation. This is summarized in diagrammatic form in Appendix I.

It is important to recognize that these significations are precursors of representation. The interactions between the mother and infant appear to be peculiarly well designed to facilitate the development of significations and then the transition from signification to representation.

Briefly, there are three varieties of significations outlined by Piaget (1953).

1. The signifier is the elementary sensory impression accompanying the play of the reflex and the signified is the action schema, for example the infant seeks the nipple and discerns it from the surrounding teguments. This indicates that the nipple has a 'meaning' for him in contrast to the other significations. Thus the sensory impression of the nipple is the signifier and the action schema of sucking the signified.

In the social situation the earliest 'organized' interaction is that of maintaining eye contact. Thus the action schema of looking is the signified, the joint visual attention the signifier. This is built up into a social structure between them by the mother capitalizing on every occurrence of this, and positively reinforcing it. Thus

1. Infant's scheme of random looking.
2. Mother's scheme of looking - frequently directed at infant.
3. 1 and 2 overlap.
4. Mother capitalizes on this situation by gesture and verbalization to reinforce it.
5. The beginning of a social structure forms, i.e. the transition into the second stage of significations.

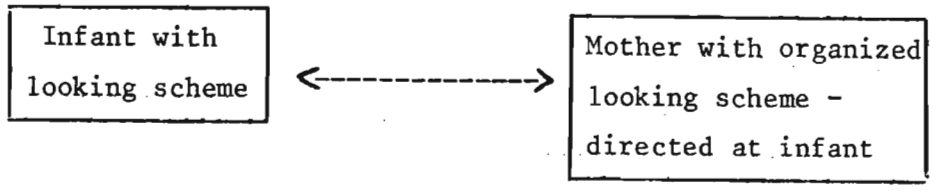


Figure 4. Diagrammatic Representation of Stage 1 Significations.

2. "The recognition characteristic of this level presupposes as signifiers ... simple sensory impressions ... call(ed) signals."
(Piaget 1953, page 115)

The signal consists of a sensory impression associated with the reaction *and* with the perceptual images characteristic of the schema: it thereafter 'announces' these images and sets in motion the reactions. For example, placing the infant in a certain position for nursing will set off the sucking schema, that is the infant's awareness of the position is a signifier for the feeding experience which will follow (signified).

This is an advance over (1) in that the action schema is set in motion by a signifier which does not form a part of it. However these significations are essentially functional and related to the infant's activity.

It is difficult to find an analogous situation in the social realm. There is a similarity in the situation in which the mother holds the infant in front of her and eye contact is immediately established, or when certain verbalizations or actions of the mother immediately achieve eye contact between them.

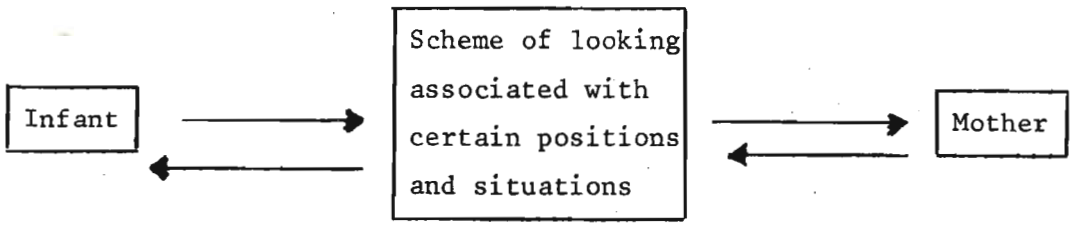


Figure 5 Diagrammatic Representation of Stage 2 Significations.

3. The third type of signification is that of indication belonging to the secondary circular reactions. These comprise, from the beginning, an element of foresight related to the things themselves.

The example given by Piaget (1953) is of the infant pulling a string to swing objects hanging from its basinette hood. There is in the signification of the string a content related to events in the immediate future. Using Garvey's (1974) terminology out of the interactional context, this whole action sequence would comprise a 'round'.

From this date the action and verbal games, e.g. 'kicking game', reveal an analogous development in the social context.

In the interactional games, one of the first of which is the verbal and action game, the 'aspect of the signified' is usually a temporal antecedent in an action sequence. In these games the infant and mother through repetition which is an integral part of the game establish a shared schema of the total action sequence. When hesitations are introduced by the mother the infant's behaviour indicates that she is anticipating the completion of the 'round'. This anticipation indicates that the preceding behaviour can be regarded as a signification of the whole.

An example of an action and verbal game is the kicking game. The sequence consists of the following elements:

i) Mother taking off infant's nappy.

ii) Holding infant's feet and 'bicycling' them while she leans over the infant saying "kick, kick, kick" in a clearly enunciated voice with a raised intonation pattern.

iii) Waiting for a response from the infant which takes the form either of ongoing leg movements or of smiling.

iv) Eye contact is maintained throughout.

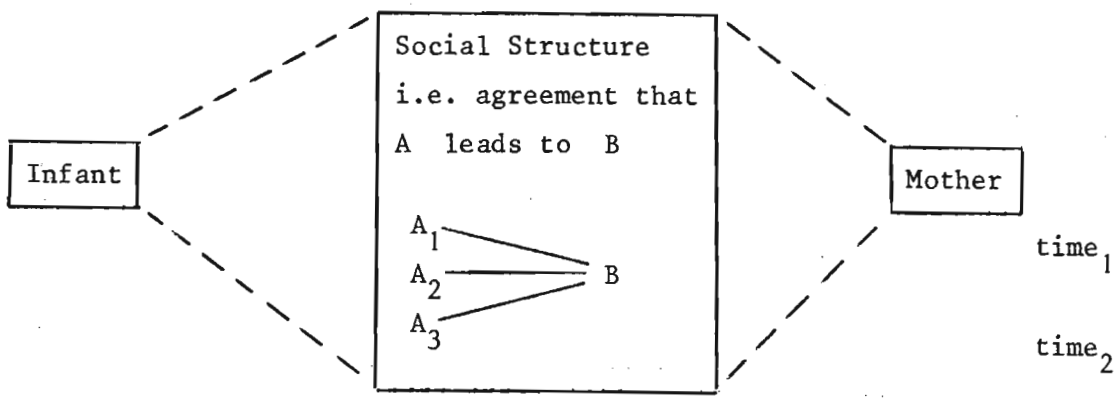
The verbalizations from the mother may be varied. The game was initially initiated by the mother. At 00:18:05 an important development occurred. The infant initiated the game immediately she was placed in the appropriate situation. This (the situation) could thus be regarded as a signification of the game.

The appropriate situation was:

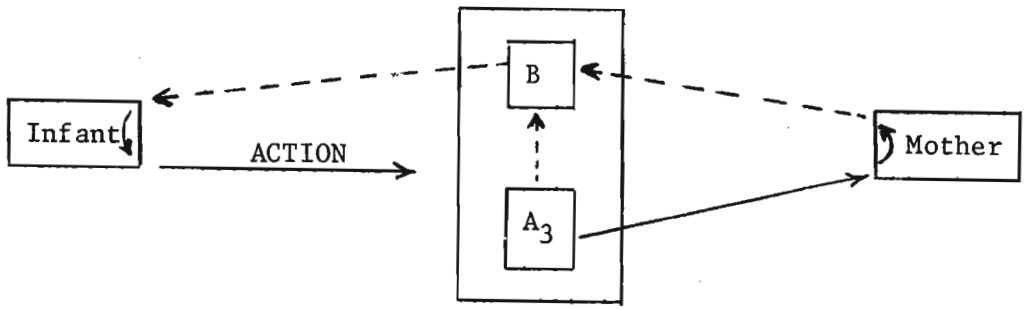
i) Infant lying on her back.

ii) Mother removing her leggings.

On this occasion Julie immediately began kicking movements against the mother's stomach. The mother's response was to provide verbal reinforcement by intoning "Kick, kick, kick". She did not take hold of the infant's feet as she had on previous occasions.



Either Infant or Mother institute A_1 --- A_3 with the expectation that B will follow. i.e. The anticipation of B preceded the A_1 --- A_3 behaviour.



e.g. B : the game of kicking of the infant's feet either by the mother or alone.

A_1: nappy changing situation.

A_2: specific vocalizations of Mother.

A_3: specific behaviour of the Infant.

Figure 6 Diagrammatic Representation of Stage 3 Significations.

The diagram would then indicate

1. Infant envisages game B.
2. Therefore emits action A_3.
3. Mother interprets A_3.
4. Therefore co-operates in game B.

The relevance of 'hesitations' introduced into a game by the mother to the development of representation is discussed below. A brief outline of a game in which it occurred follows. These hesitations were introduced into most of the verbal and action games.

Obs. 5 - J 00:18:05

Mother: sitting on floor holding Julie under the arms upright on her knee.

element 1 { Bounces her up and down, intoning "Jolly, jolly jumper, You're a jolly jumper" then holds Julie up at the level of her face.

element 2 Noisily kisses her on her tummy.

element 3 Infant: laughs.

The entire episode is repeated a number of times. Then the mother introduces a hesitation between elements 1 and 2. During this pause she carefully monitors Julie's response. The infant displays anticipatory behaviour and then appears fretful. At this moment element 2 is enacted. Julie's response is again a delighted laugh. The hesitation in completing the sequence then itself becomes a feature of the game. Over a number of presentations these periods of hesitation increase.

With these hesitations, the mother is compelling the infant to hold a memory image of the completing element. From the infant's behaviour one can infer that she knows that the round is incomplete.

This interaction is representative of stage 3 significations. The sequence of the game appears to be known to both members of the dyad, thus one can infer that Julie has a schema of the whole sequence.

However, complete separation of the signifier from the signified cannot yet be attributed to either of these examples because in the first example the initial stimulation of the leggings and anppy removal is present before the infant introduces the beginning of the round and in the second, the game is taking place in the immediate present.

In the developmental sequence of introduction of object, exchange of object, incorporation of object into a rule following sequence, it is possible to trace the gradual separation of signifier from signified. Initially the object is what is being perceived but as it becomes possible to incorporate it into extended action patterns involving relationships between objects and with another person it must achieve a status of its own within these relationships and therefore the possibility of being represented. This is evident in the development observed in the game of handing blocks to the infant.

Obs. 6 - K 00:48:00

Mother: holding out block at eye level to infant.
Infant: right hand stretches out to block - visually fixating block. Hand closes before reaching block and she bypasses it. Attempts again with right hand towards block, again hand closes before reaching block, knocks block out of mother's hand.
Mother: retrieves block, re-offers it.
Infant: fixates block - grasps it with right index finger, ring finger and thumb.
Mother: supports the block, thrusts it into infant's grasp - withdraws hand. "Ta"
Infant: raises arm, looking at mother, smiling. Block drops from grasp.

Obs. 7 - K 01:32:00

Infant: stretches forward with her left hand towards the right. Vocalizes 'i i'.

Mother: 'Mmm' - does not look up from book.

Infant: turns towards mother with left hand outstretched, touches the mother's hand. Vocalizes.

Mother: opens her hand to reveal the knob from the ring toy. Smiles at infant.

Infant: takes the knob - leans towards the right. Vocalizes and attempts to put the knob onto the peg.

Mother: leans forward - taps the peg. "No, this is wrong here".

Infant: sits back, withdrawing hand and looking fixedly at the ring toy.

Mother: removes the two top rings. "You see, this one's not right." Puts them on in correct order. "You see."

Infant: watching intently.

Mother: "Look, we should put this one on first." Puts on a ring. "And then this one." Picks up the construction and places it in front of the infant (mother has last ring in her hand).

Infant: leans forward, vocalizes and takes the ring from mother. Immediately places it on top of the peg. Leans back and vocalizes.

It is clear that the infant is directing both her own and her mother's activities towards the completion of the task. This situation is characteristic of stage VII of the developmental sequence outlined in Section II. The fact that the mother mediates all these advances indicates not only that she has adapted her expectations of the interaction to the ability of her infant, but also that the goal for her is the achievement of one of skilled behaviours which contribute to the

successful conduction of joint co-operative interactions and thus to the attainment of representation and symbolic communication. The progress that is made cannot be attributed entirely to the mother: the effects of maturation must be considered.

> "Thus the effects of maturation consist essentially of opening new possibilities for development, that is, giving access to structures which could not be evolved before these possibilities were offered. But between possibility and actualization, there must intervene a set of other factors such as exercise, experience and social factors."
> (Piaget 1970b, page 720)

6.4 SUMMARY.

Before introducing Speech Act Theory a summary of the concepts reviewed up to this point is necessary.

1. The Genevan School's perspective on language and the relevance of this to this research.

2. The concepts from the Genevan theory of cognitive development which are regarded as central to the methodology developed in this research. These concepts are:
   (a) Structure and function.
   (b) Adaptation and organization.
   (c) Representation.
   (d) Significations which are the precursors of representation.

Where modifications to these concepts have been necessary to enable them to be applied to this interactional analysis, these have been included. The significance of the 'asymmetrical dyad' to the ontogeny of communicative competence was also discussed. It should be clear that these concepts do not refer to discrete elements or processes but that these processes and elements are all interrelated with each other in extremely complex ways.

7.0 THE CONTRIBUTION OF SPEECH ACT THEORY.

The notion of speech as action derives from a tradition introduced by Malinowski (1923) who claimed that

> "... in all the child's experience, words *mean*, in so far as they act and not in so far as they make the child understand or apperceive. His joy in using words and in expressing himself in frequent repetition, or in playing about with a word, is relevant in so far as it reveals that active nature of early linguistic use." (page 321)

In terms of psychological development the notion that speech is based on action derives from Piaget's (1953) uncompromising position that intelligence, and therefore language, originates with the infant's action on the world.

Searle's (1969) theory of Speech Acts provides a theory of communication which enables the incorporation of preverbal communicative skills. It emphasizes too the relevance of the social context in which any communicative act is made and the importance of rules in the regulation and performance of these communicative acts. Although Searle developed his theory to accommodate developed language, the concepts of the theory can be applied to preverbal communication. Speech Act theory can be seen as fundamentally distinct from Chomsky's theory of transformational grammar in that the analysis is in terms of the function the communication serves between the interacting individuals rather than the structure of the communication. The relevance of conventions and rules is, however, not ignored.

The contribution of Grice's theory of meaning (1957, 1972) to both Searle's theory and to developmental psycholinguistics is important. Dore (1973a, 1973b, 1974, 1975), Bruner (1974, 1975, 1976), Ninio & Bruner (1977) and Carter (1975) have adopted a speech act approach in their research and have made important theoretical and empirical advances in developmental psycholinguistics.

It is necessary to deal with Searle's theoretical argument at some length because it is central to this research. The following are important features of Speech Act theory.

1. All linguistic communication involves speech acts.

> "The unit of linguistic communication involves ... the production ... of the symbol or word or sentence in the performance of the speech act."
> (Searle 1969, page 16)

2. The notion of speech act implies the intention of a speaker.

3. Speaking is a rule governed behaviour thus a theory of language is part of a theory of action[1].

4. Whatever can be meant can be said - what Searle calls the Principle of Expressability.

These four features suggest a series of analytic connections between

(i) the notion of Speech Acts
(ii) what the speaker means
(iii) what the utterance means
(iv) what the speaker intends
(v) what the hearer understands
(vi) what the rules governing the linguistic elements are.

In uttering a sentence, the utterer is performing at least three distinct kinds of acts.

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[1] This statement is important because it provides for the extension of Speech Act theory to include communicative acts which may be actions unaccompanied by speech. Thus communicative acts could be regarded as the more general term, Speech Act forming a subset of them.

(i) utterance acts = uttering words, morphemes, etc.

(ii) propositional acts = referring and predicating.

(iii) illocutionary acts = stating, questioning, commanding, etc.

These three acts are not to be seen as separate things but as having different identity criteria.

Thus:

John smokes.

Does John smoke?

Smoke John.

are three different utterance and illocutionary acts but the same propositional act.

Here John?

Here John.

are two different illocutionary acts, but the same propositional and utterance acts.

Propositional and illocutionary acts consist in the uttering of certain words in sentences in certain contexts, under certain conditions and with certain intentions. The illocutionary force of an utterance refers to the *intention* of the speaker.

These three acts are related to the utterer: to develop the theory to include the hearer it is necessary to incorporate Austin's (1962) notion of the perlocutionary act which accounts for the effect of the utterance on the hearer, e.g.

X in arguing with Y may

persuade Y to do something.

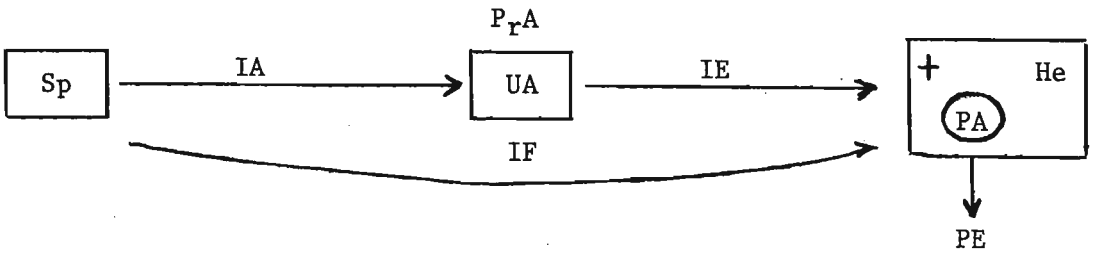
X in warning Y may

alarm/frighten Y, etc.

It should be clear that the perlocutionary act need not be an intentional act, it may be an unintended consequence of the speech act (the speaker may not intend to alarm the hearer). There is a distinction to be made

between perlocutionary act and perlocutionary effect: the latter refers to the behaviour elicited in the hearer by the speech act, the former refers to the effect aroused in the hearer by the speech act. The perlocutionary act and perlocutionary effect need not be the same. A hearer may be alarmed by a speech act but act as though he is not.

Finally, the illocutionary effect refers to the hearer's uptake/ decoding of the speech act which will depend upon an intersubjectivity between speaker and hearer, conventions and rules. The following diagram illustrates the various aspects of the relationship between speaker and hearer.



where

Sp = speaker
He = hearer
UA = utterance act
P_rA = propositional act
IA = illocutionary act
IF = illocutionary force
IE = illocutionary effect
PA = perlocutionary act
PE = perlocutionary effect

IE should be similar to IF

Figure 7 Diagram to Illustrate the Various Elements of a Speech Act.

It can be seen from the diagram that Speech Act theory requires that speech be treated as a process of interaction and that the hearer forms an integral part of the act. The perlocutionary effect may

simultaneously be regarded as an utterance act and initiate another sequence going in the reverse direction. The 'He' is now the 'Sp' and *vice versa*. The utterance act will be uttered according to certain rules and conventions of language which will ensure that the 'IF' and 'IE' must be similar enough to enable the communication of a message between the speaker and the hearer (these roles are, of course, reversible).

There has to be agreement[1] between speaker and hearer is this system is to function. This *agreement*, in the communicative context, can be seen as a special subset of social structures referred to in 9.2 and embodies *far* more than merely the lexicon and syntax of the language.

Thus language is best seen as a social phenomenon involving the trnasmission of information between a speaker and a hearer. The assumption that the speaker intends to transmit information in the performance of a speech act is an integral aspect of the functional view of language explicit in speech act theory.

Once language enters the behavioural repertoire it is the most common and most abstract form of communication between humans and is a prerequisite for the communication of complex messages and for many of the illocutionary acts, e.g. promising. However, language is not necessary for all communication, indeed, even in adult communication information can be transmitted without resort to language. In the infant interacting with his mother there is a great deal of information transmitted both from the mother to the child, the mother's communications comprising mainly speech acts which are elaborated by actions upon objects in the world, and from the infant to the mother in the form of communicative actions. That the mother understands her

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[1] This nebulous link between speaker and hearer has been referred to as intersubjectivity (Kant 1932, Habermas 1970, Ryan 1974)

It has an analogy in the Social Conscience proposed by Durkheim (1933) and the notion of the 3rd World of Knowledge proposed by Popper (1972).

infant is evident from observations of the success of their interactions.

In a recent paper Du Preez (1977) following Austin (1962) distinguishes between perlocutionary and illocutionary acts and proposes that the speech acts of early childhood are best conceived as perlocutionary acts. Illocutionary acts as defined by Searle (1969) cannot be said to occur until the child is three to four years of age. One of the reasons for this distinction is that language behaviour in the early phases is maintained by its consequences and that it is from these consequences that rules are abstracted. Du Preez goes on to state that perlocutionary acts do not depend on intersubjectivity but that illocutionary acts do, and that to trace the production of well formed speech acts a theory of the development of intersubjectivity is necessary (page 73). This latter statement is accepted and is reflected in much of the current research into language acquisition (Dore 1973a, Ryan 1974, Bruner 1975, Krige & Albino 1977, etc.). However the former statement infers the distinction between language and other forms of communication which this author has already argued should be rejected (see page 10) and this again creates an artificial barrier in development between two different kinds of systems[1]. For the successful execution of communicative actions an intersubjectivity between the actors is a prerequisite. As will be evident in the data reported in Section II this intersubjectivity is present in the communicative actions of mother and infant during the first year of life (from stage IV of the postulated developmental sequence). There is no doubt that these early communicative acts lack many of the features of well formed speech acts and that the contingency of the reaction to these actions (the perlocutionary act) is of the utmost importance. However to assert that intersubjectivity is absent is not supported by the evidence of this research nor would it seem to contribute to a clearer understanding of the processes involved.

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[1] This is the first suggestion of extending the age at which the system undergoes a qualitative change: the majority of studies have attempted to reduce the age at which this change occurs by introducing theories of child grammars constructed around the holophrase.

That some form of 'insincerity' can occur in action has been described by Piaget (1953). His daughter feigning sleep by adopting a pose known to both of them to be associated with going to bed would seem to fulfill this condition and to reflect an intersubjectivity between them. It is accepted that this is not possible in language until much later (Brown's 1973 stage V) which endorses the argument that the distinction between language and other forms of behaviour does in fact obfuscate the cognitive and communicative processes which are in fact present in the developing child and which must be studied if the development of the most evolved and abstract form of communication (language) is to be explained.

7.1 MEANING.

Successful communication is dependent, among other things, upon agreement about meanings[1] of actions.

The theory of meaning adopted in this research is Searle's (1969) revision of Grice's (1957) theory. A distinction made by Grice is that between natural ($meaning_n$) and non-natural ($meaning_{nn}$) meaning. Under $meaning_n$ Grice includes such senses of 'mean' as occur in "Clouds mean rain"; "Those spots mean measles"; under $meaning_{nn}$ he includes "Those three rings of the bell (of the bus) mean that the bus is full". Examples from this corpus of data: the neonate crying means that it is

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[1] Meaning is necessary but not sufficient for arriving at agreement - other features, e.g. reciprocal turn-taking, attending to the actor, etc., are also required if the speech act is to be successful. These features would be included in Habermas' (1970) Dialogue Constitutive Universals and Grice's Conversational Maxims. It is these features which Ryan (1974) suggests have been overlooked in psycholinguistics.

hungry (meaning$_n$). The infant pointing at an object and vocalizing means that it wants the object (meaning$_{nn}$). This distinction is important for the purposes of this study for the following reasons:

(i) The neonate's signals can initially be regarded as having a meaning$_n$.

(ii) The mother's communicative acts are predominantly meaning$_{nn}$.

(iii) The mother frequently behaves as if many of the infant's signals have meaning$_{nn}$.

(iv) At some point in the infant's development there is a transition from communications being predominantly meaning$_n$ to being predominantly meaning$_{nn}$. At this point one can infer that a qualitatively different type of interaction between the mother and infant is possible. This transition must be important for the acquisition of conventional communicative actions including language.

Searle makes no revision to Grice's meaning$_n$ - it is his explication of meaning$_{nn}$ which is revised in the following manner.

1. Grice's original analysis:
Speaker S means nn something by X.
(a) S intends (i - I) the utterance U of X to produce a certain perlocutionary effect PE in hearer H.
(b) S intends U to produce PE by means of the recognition i - I.

2. Searle's revision.
S utters sentence T and means it (i.e. means literally what he says) = S utters T and
(a) S intends (i - I) the utterance U of T to produce in H the knowledge ... that the states of affairs specified by ... the rules of T obtain (call this effect the illocutionary effect IE).
(b) S intends U to produce IE by means of the recognition of i - I.
(c) S intends that i - I will be recognised in virtue of ... H's knowledge of ... the rules governing T.

This revision includes the notion of *rules* governing communication and thus extends Grice's analysis to include the recognition of the language system as a cultural system which exists independently of any of the native speakers. Speech act theory with a few modifications can thus provide the psycholinguist with the necessary concepts to implement an empirical study into the preverbal communicative behaviour of the infant by providing an interactional perspective on communication thus making the mother-infant dyad the unit of study. To extend this theory down into the preverbal period it is necessary to broaden the interpretation of utterance and language to include non-linguistic communicative acts. This has been done by Dore (1973a, 1973b, 1974, 1975), Bruner (1975, 1976), Greenfield & Smith (1976), Bates (1976) and others.

7.2 RULES: LAWS AND CONVENTIONS.

According to Ganz (1971) rules are linguistic entities which have no truth value, are followable and are prescriptive. They have been adopted by their users and remain in force until they are unadopted. He offers the following criteria for determining if a person P is following a rule R.

(1) P fulfils R (in his behaviour).

(2) P knows R.

(3) P sees to it that his behaviour fulfils, or he tries to fulfil R.

There are three types of description which can be used in terms of these three criteria. It should be possible to state which criteria apply to an observed behaviour.

Type 1: The behaviour only is described. For example: "All women

wear skirts."
To say this inscription is a rule that "All women (shall) wear skirts" adds no more to the situation.

Type 2: Describes the behaviour *and* asserts P's behaviour fulfils R and that P knows R.

Type 3: As Type 2 with the addition that P is seeing to it that his behaviour fulfils R. That is, he is consciously using the rule.

In the research data reported in Section II an attempt will be made to apply these criteria.

It is necessary to differentiate between rules and laws. The following four criteria apply to laws.

(1) For laws Type 1 descriptions only are possible.

(2) Laws are not breakable, and not followable by a decision to follow.

(3) Laws are discovered, rules are decided upon. This distinction is not absolute for discovery of laws often involves invention of concepts, and the creation of rules often depends upon what is the case - you can't have a game that defies gravity.

(4) Laws can be falsified or confirmed by examples. Rules cannot - that is, that have no truth value. This latter distinction is the strongest.

With reference to rules, a further important distinction is that made by Searle (1969) between *regulative* and *constitutive* rules. He provides the following definitions:

(1) "Regulative rules (rules r) regulate antecedently of independently

existing forms of behaviour" and

(2) "Constitutive rules ... create or define new forms of behaviour" (page 33)[1].

The examples that he provides are for (1) the rules of etiquette which regulate interpersonal behaviour, and for (2) the rules of football or chess which not only regulate the playing but define the game, i.e. the game would not exist apart from the rules.

Searle argues that constitutive rules provide the basis for specifications of behaviour which could not be given in the absence of rules: this is particularly important in language where the semantic structure of a language can be regarded as the conventional realization of a series of sets of underlying constitutive rules. Searle formulates various sets of constitutive rules necessary for the performance of certain types of speech acts, e.g. promising, asserting. The communicative acts of which the infant is capable obviously fall far short of those listed by Searle. But one would anticipate that in the less complex and incomplete forms of communicative acts which are present, one would find evidence of some skills which are precursors to fully formed speech acts.

Searle's analysis was based entirely on developed speech: and even at this level of development he finds it 'difficult to clarify' the distinction between $rules_r$ and $rules_c$. It is not surprising, therefore,

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[1] The criticism Sanders & Martin (1976) make of Searle's formulation of $rules_c$ is conceded. However, these criticisms do not obviate the relevance of $rules_c$ as outlined by Searle, to preverbal behaviour. The introduction of a third category of rules (which incorporates the distinguishing features of $rules_c$) - grammatical rules ($rules_g$) by Sanders & Martin is relevant when language itself is the object of discussion (see also Saunders 1973). $Rules_r$ and $rules_c$ are sufficient for the purposes of illuminating the establishment of the conventions which underlie communicative competence in the preverbal period.

that these distinctions are even more blurred in application to the behaviour of the infant. An added complication, already referred to, is that the unit of study comprises two systems of such diverse ability, the mother and her infant. It has been argued and observed in this research that in the neonate neither $rules_r$ nor $rules_c$ are present. These develop during interaction with caretakers.

The way in which the mother selects from the infant's stream of behaviour those units to which she responds can be seen as progress towards the formation of $rules_r$ (contingent and predictable reaction to certain infant behaviours). Also, the type of interactions in which the mother and infant indulge are limited by the capacities and requirements of the infant. There is in each instance of this circumscribed number of interactions a high degree of predictability, e.g. the feeding situation, changing situation, for the infant.

The first $rules_r$ will be established out of the innate reflexes of the neonate to which the mother responds. The development of these $rules_r$ is similar to the development of schema in Piaget's theory. However the emphasis in this research differs from that of Piaget. Whereas he traces the development from reflex to cognitive schema, this research is concerned with the establishment of the social $rules_r$ and $rules_c$ which regulate and, indeed, enable communication to take place. These social rules are integrated into social structures as described in 9.2.

The initial social structures of the neonate and caretaker consist of systems of $rules_c$ and $rules_r$ which eventually become complex enough to include the rules regulating the activity of individuals in the social group, for example rules of etiquette, rules of games, rules of institutions, *and* the grammatical rules (Sanders & Martin 1976) which underlie the language and other abstract symbol systems of the community.

Some rules remain at the level of $rules_r$, for example rules of reciprocity in communication or of maintaining a phatic channel. Others are gradually built up into more complex routines which come to

comprise a system of $rules_c$, for example the establishment of a game which requires adherence to a specific sequence of events if it is to be correctly completed: the game of constructing a tower out of blocks can be seen as dependent upon $rules_c$.

The relationship between rules and conventions must be explored: a rule does not require knowledge of the other person. A convention does. For example, rules of grammar can be used by me now, talking to nobody; but when in conversation the interactors obey conventions. Schiffer (1972) provides a well argued modification of Lewis' (1969) notion of convention, the summary of which is:

> "Conventions result from the fact that there are certain ends which can be brought about by doing an act of a certain sort if and only if there is mutual knowledge of a certain sort between certain people. But the kind of knowledge required is not the same for every type of convention. For example, in cases involving a co-ordination problem it is crucial that it be mutual knowledge that anyone in a certain sort of situation will do X (e.g. that people will drive on the left). In other cases, however, what is crucial to know is *not* that one *will* do X in a certain sort of situation, but only that *if* one does X, then such-and-such will be the case. Thus, for communication to be possible it is not necessary that it be known what people will utter; what is essential is that it be known that if someone utters x (in such-and-such circumstances), then he will mean such-and-such." (pages 154, 155)

Schiffer's concept of 'mutual knowledge' is similar to the concept of agreement which has been introduced in this study. The latter term would seem to be more appropriate to a preverbal organism for it does not imply the level of cognitive functioning[1] which the concept of knowledge does. Thus with the notion of convention one is placing emphasis on the relationship between two or more actors rather than on the system of rules, which co-ordinates and indeed makes possible their communication, in abstraction.

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[1] For example symbolic representation, awareness, memory and reflection.

The rules and conventions which are formed in the preverbal period continue to be a fundamental part of all social interaction. Obviously more complex systems of $rules_c$, conventions and new $rules_r$ will develop as the growing child's social world becomes increasingly complex. These new rules and conventions must however be seen as extensions and modifications of the earliest rules the infant acquires. Without these primary rules no further rules could develop. It is for this reason that the study of the development of language, which is a communicative system dependent upon $rules_r$, $rules_c$ and grammatical rules, must begin with the development of the first $rules_r$.

8.0 A BRIEF NOTE ON INTENTION.

Dennett(1973) states that there appears to be a principle among some philosophers that mechanistic or causal explanations replace purposive or intentional explanations. He terms the former the classical and the latter the grammatical paradigm. He refutes this stance and in his argument recognizes three 'stances' (one of which is subdivisible) which can be taken towards systems. Failure to distinguish these three stances, each of which is relevant in different situations, has, he argues, led to confusion. These stances are not reducible to each other and none is *a priori* more fundamental than the other. The stance depends on the object requiring explanation.

The stances he recognizes are:

(1) The design stance.

(2) The physical stance.

(3) (a) The intentional stance.
(b) the personal stance.

1. The design stance will serve as explanation if one has complete knowledge about the design of the system. This enables prediction of the response in any situation. This stance is usually adopted in making predictions about natural objects. However, the mother interacting with her neonate frequently adopts this stance in interpreting and responding to her infant's early behaviours. For example, that cry means that she is hungry.

2. In the physical stance, predictions are based on the state of the system and are worked out according to knowledge of the laws of nature. This stance is usually reserved for instances in which prediction fails. For example, she does not usually behave like that, she must be tired.

3. In the intentional stance the predominant feature is rationality: it is essential to adopt this stance for explanation of most human interaction. Where this assumption fails, as it would in interacting with mentally disturbed individuals, the quality of interaction changes and probably would be most effective if conducted according to the design or physical stance. The intentional stance is not the preserve of human interaction. As noted by Dennett (1973) the behaviour of some computer systems can best be predicted if one adopts the intentional stance towards them.

The subdivision within this third category, that of the personal stance, presupposes intentionality of the system but requires as well a moral commitment to the system. Destroying a computer and destroying a human, although both conceived of as intentional systems, entail very different moral issues.

Communication is an interaction within the intentional stance. Thus implicit in the notion of communication is intentionality or rationality albeit of a unique nature in that underlying the communicative act is the intention of the actor A to produce a response in the recipient B and to intend B to recognize his (A's) intention and to respond on the basis of this recognition. Whether the communication is a conventional one, i.e. speech, certain gestures, or one that is idiosyncratic and understood only by the members of the communicating dyad, it is a prerequisite that the expression of the intention be interpretable to B. There must be a shared meaning between the interactors about the form of the expression (intersubjectivity). If it is A's intention to influence B to give him an object and he asks for it in a language unintelligible to B, he will not communicate his intention. However, if he utters, "Please give me the hammer", and the message is understood he has achieved the illocutionary effect of the utterance.

> "... individuals who are interacting can do so successfully only if they have comparable understandings of what is signified by a given set of verbal and/or non verbal acts at a given point in a given situation, and more important perhaps, comparable understandings of what can be *meaningfully* signified at a given point in a given

situation."
(Sanders 1973, pages 6 and 7)

However, whether the perlocutionary effect is executed, i.e. that the hammer is handed over, will depend on B. This illustrates the meaning attached to the communication in the above example will be meaning in the non-natural sense (Grice 1957).

As has already been stated, it is necessary in studying the ontogeny of communicative competence that one recognizes that the dyad which is the unit of study comprises elements of very different capacities: the mother and the infant.

In terms of Dennett's (1973) thesis, the mother's behaviour will be explicable mainly in terms of the personal stance. However, the stance one adopts towards the infant is not as easily categorized. Because of the infant's nature, one adopts the personal stance, but in terms of understanding its behaviour one adopts either the design or physical stance. Neonates are not initially regarded as intentional beings. Even if speech acts addressed to them imply this. At some point in development interpretation of the infant's behaviour in terms of the design or physical stance declines in relevance as the intentionality of the infant's behaviour becomes increasingly apparent. Because the personal stance presupposes the intentional stance and because the neonate's behaviour is not intentional, reasons given by the mother for her behaviour towards her infant are often ambiguous. This must be recognized in interpreting the mother's behaviour. The adoption of this personal stance towards the infant without the concomitant recognition of intentionality is important in introducing and maintaining a predictability in mother-infant interaction. The relevance of predictability to the establishment of rules has been referred to.

9.0 APPLICATION OF SOME OF THE CONCEPTS DISCUSSED TO THE ONTOGENY OF COMMUNICATIVE COMPETENCE.

Assuming:

1. That intentional communication between the mother and infant is taking place, it becomes meaningful to examine the behaviours of the infant in an effort to isolate behavioural sequences which embody an illocutionary force (and may include propositional and perlocutionary acts) and which are interpreted by the mother (illocutionary effect) as if the infant was intending a communication.

2. That the communicative events which are isolated are precursors of speech acts, an analysis of these will provide information on the developing cognitive system, the expanding social awareness of the infant and bridge the transition between pre-speech and speech which has as yet not been adequately dealt with.

3. That these pre-speech communicative acts must themselves develop out of the social interactions between the infant and her caretaker, a detailed investigation of these interactions from birth should provide the continuity to language development theories which is at present lacking.

9.1 PRIMITIVE SPEECH ACTS AND PRE SPEECH ACTS.

As has already been stated in 7.0, speech act theory provides the concepts necessary to investigate the ontogeny of communicative competence. Dore (1973a) introduced the concept of 'Primitive Speech Acts' which are communicative acts which consistently contain either a word or vocable (in the latter the phoneme pattern must be used

consistently to refer to one object or action. An example of this would be the phoneme 'Hnn' used by the child in the Greenfield, May & Bruner (1972) film 'Early Words' to refer to an object for which the name is not known.) Dore's investigation is therefore at the barrier of prespeech/speech. He has not studied the development which precedes this. His definition of Primitive Speech Act excludes all communicative behaviour unaccompanied by recognizable sound patterns. To incorporate these the term Pre Speech Act has been introduced. This refers to communicative acts (which in the early stages may just be appropriate reactions to the mother's speech acts but which serve to prolong the interactive sequence) which do not contain a recognizable or consistent pattern of sound. They may in fact be silent, for example pointing at an object and stamping the foot may communicate "I want that object".

As will be evident in the data, much of the early interaction between mother and infant involves the establishment of a 'Phatic Channel' defined by Jakobson (1968) as a channel for communication. The Phatic Channel can exist in the absence of any form of speech act. Mutual eye contact of a certain kind or reciprocal appropriate verbalizations or vocalizations can be conceived of as two different ways of establishing and maintaining a phatic channel. It is into this channel that content is introduced. The establishment of a Phatic Channel between mother and infant receives priority in their early interactions. The developmental sequence from movements to speech acts can be diagrammatically represented (see Figure 8).

In the development towards communicative competence which will ultimately include speech acts, the system of rules and conventions must be acquired by the infant. Also, most importantly, an intersubjectivity between mother and infant must be established. Gradually the infant must learn that certain behaviours will have certain consequences. When this has been established, these behaviours can be intentionally performed by the infant to bring about these consequences. These behaviours may be actions on the natural or the social world. The developmental sequence of intersubjectivity

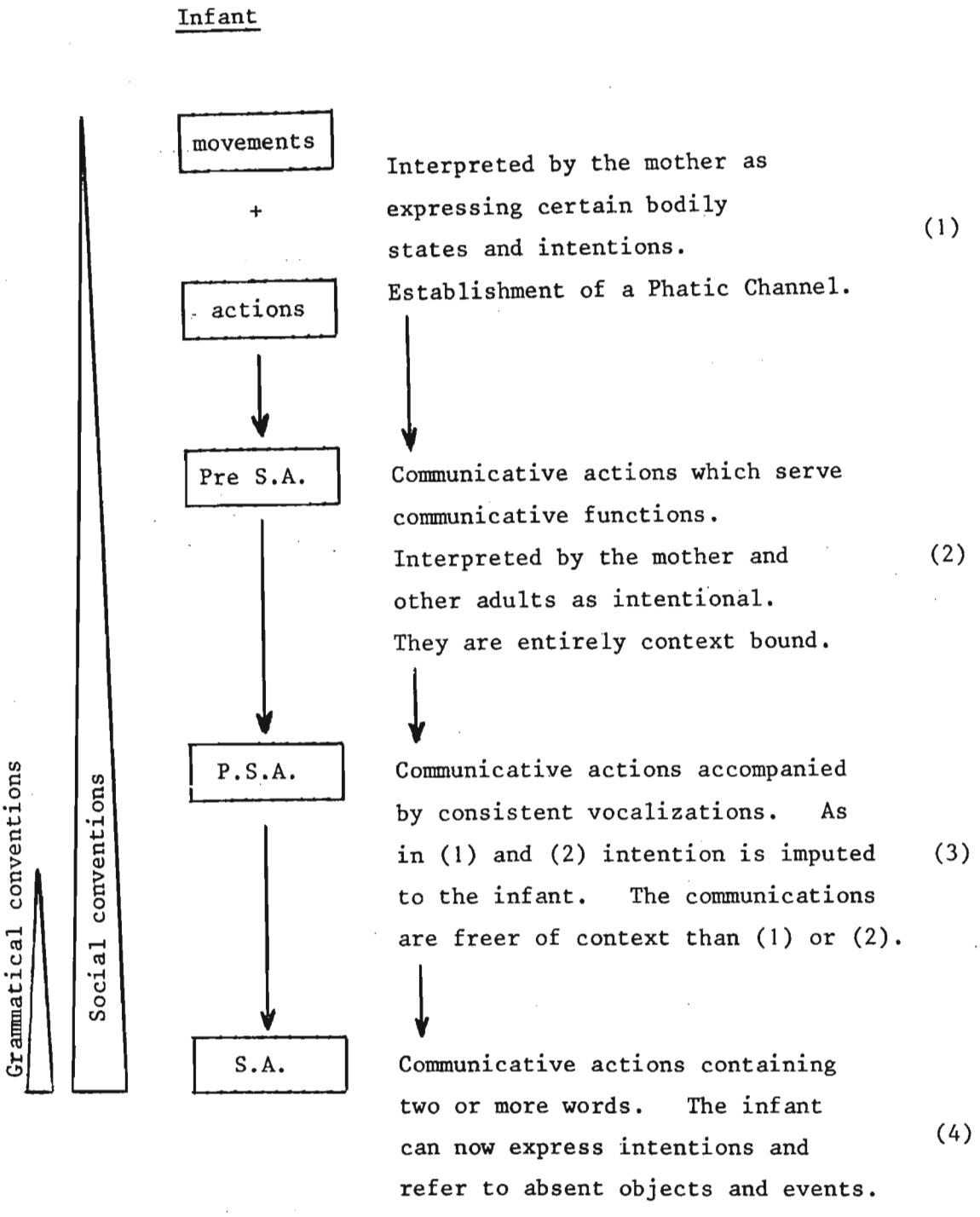

Figure 8 Diagram to Illustrate the Transition from Movement to Speech Acts.

Pre S.A. = Pre Speech Acts
P.S.A. = Primitive Speech Acts
S.A. = Speech Acts

can be diagrammatically represented (see Figure 9).

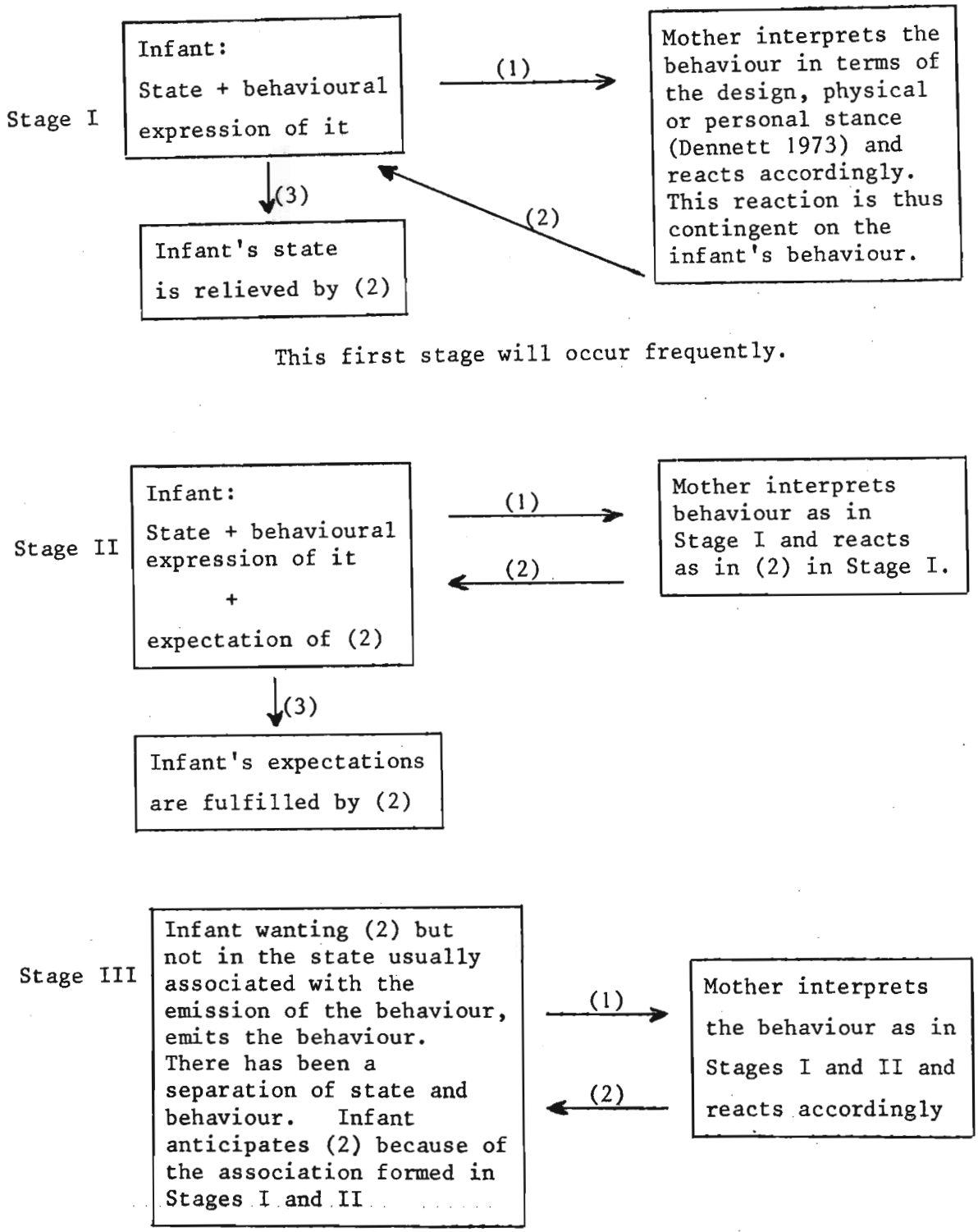

Figure 9 Developmental Sequence of Intersubjectivity.

In this third stage, the 'behaviour' stands now as a signifier in relation to the mother's reaction, the signified. Both mother and infant share an understanding about what the behaviour means. Because the behaviour is dissociated from its original state the infant has increased its control over both the social and the natural world.

It should be evident that eventually sounds can replace the behaviour, thus increasing the infant's adaptive functioning in its world. An hypothetical example of this developmental sequence follows (see Figure 10).

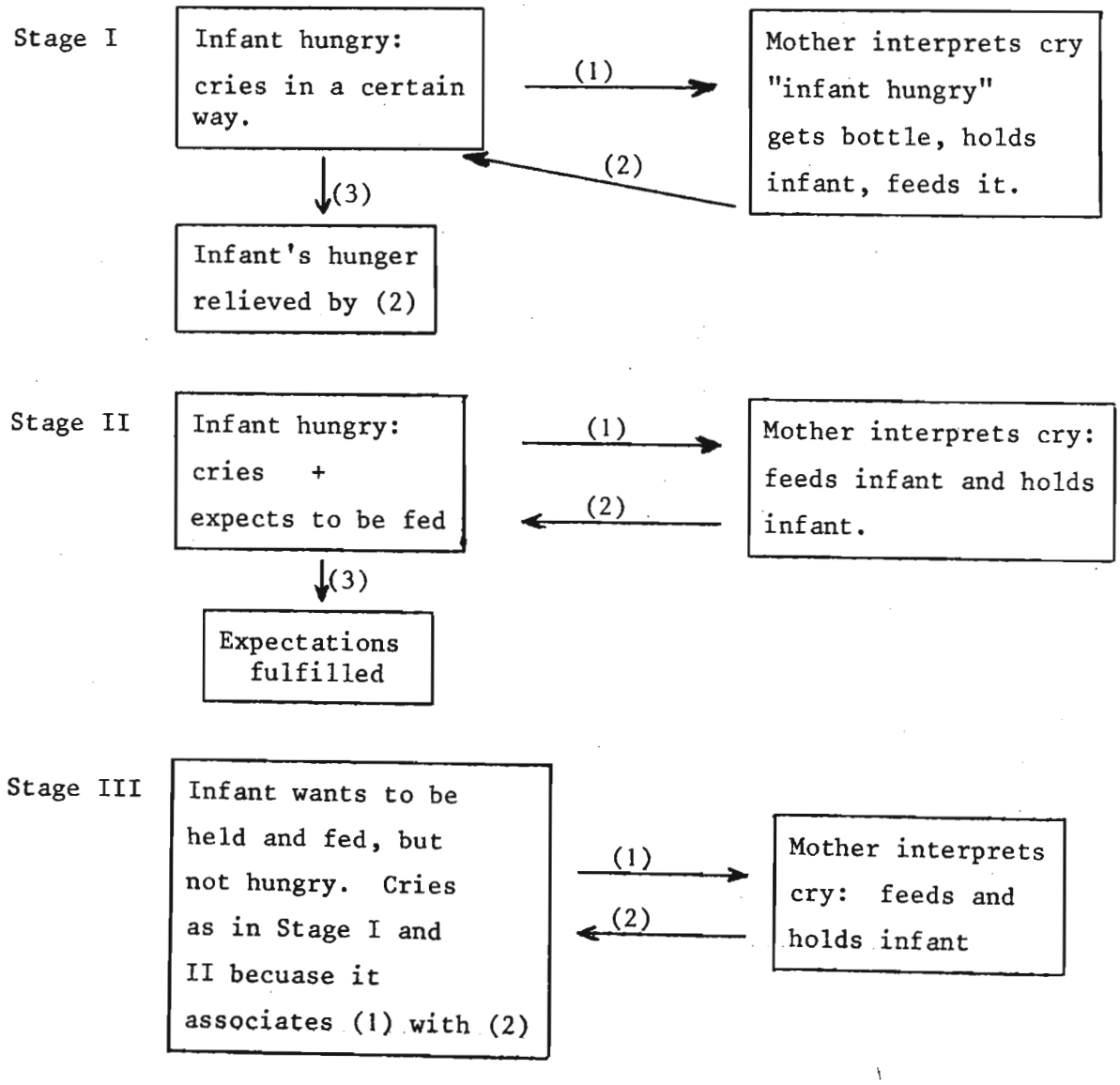

Figure 10 Hypothetical Example of Developmental Sequence of Intersubjectivity.

It is clear how these interactional behaviour patterns can be modified. If the infant in Stage III refuses the bottle but clings to the mother and cries whenever put down, the mother will adjust her interpretation of that cry in terms of this new reaction from her infant. The most important feature in the establishment of intersubjectivity is the sensitive and consistent responsiveness of the mother. The important part played by the mother in other areas of development has been well documented: e.g. Ainsworth (1967) in the development of attachment; Thomas, Chess & Birch (1970) in the development of personality. Many of the recent studies on socialization and language development emphasize the fundamental importance of this relationship, e.g. Bruner (1975, 1976), Richards (1974, 1975), Schaffer (1977), Carter (1975).

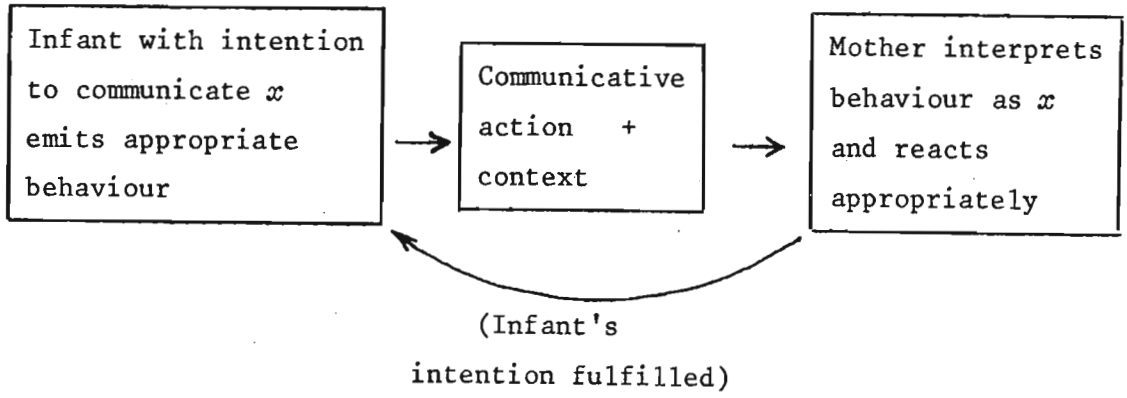

Figure 11 Diagrammatic Representation of the Relevance of Maternal Responsiveness in the Establishment of Intersubjectivity.

At this stage, if the relationship of the behaviour to x is an arbitrary one established by agreement between mother and infant, e.g. waving denoting 'go away', one can state that the meaning of this behaviour is non-natural in terms of Grice's (1957) distinction. This establishment of non-natural meanings is essential for the acquisition of language.

The following example from the data utilizes speech act terminology.

Infant I F : I want the block
C A : Infant points at block and vocalizes
I E : Mother interprets the C A as the infant wanting the block
P E : She gives the infant the block.
(Abbreviations as in Figure 7.)

Increasing complexity of interaction and maturation of the infant's cognitive and motor system will lead to increasing economy in the communicative system so that, in the above example, the point could be omitted from the C A and the vocalization become consistent - thus the next stage, Primitive Speech Acts, is reached.

These Primitive speech acts will be understood best by people in frequent interaction with the child. The infant's expanding social world, ongoing exposure to language and encouragement of his caretakers will facilitate the transition to speech acts. Carter (1975) describes how her subject 'David' acquired the use of 'more' and 'mine' and how these differentiated out of an 'object request morpheme' plus the action of reaching towards the object. This gesture diminished in frequency of occurrence as the words themselves became sufficient to achieve his intentions. Ninio & Bruner (1977) describe the appearance of referential terms out of pointing and vocalizing. Thus with the acquisition of these skills the infant moves into the linguistic stage.

9.2 THE DEVELOPMENT OF SOCIAL STRUCTURES.

Sinclair (1975) notes that

> "cognitive structures ... (are) coherent systems of mental operations which allow the thinking person to arrive at concepts, to solve problems and come to conclusions."
> (page 275)

This definition can be adapted slightly, retaining the general meaning but extending it to include social structures: social structures are coherent systems of social operations which allow the interacting persons to share concepts, to co-operate in problem solving and to come to mutually acceptable conclusions. Figure 12 represents a possible manner in which social structures develop.

The interesting feature of this system is that changes in the infant's or the mother's cognitive system will lead to changes in the 'social system' and changes in the 'social system' will lead to changes in their respective cognitive systems[1]. The dynamic of development, both cognitive and social, is thus greatly expanded by adopting this perspective.

It has been shown by Trevarthen (1974) and by Brazelton et al (1974) that the neonate responds differentially to social and non social stimuli: what makes the discrimination relevant is that the infant pays preferential attention to social stimuli. The features of the stimulus which optimally attract the infant are all present in the social stimulus (see 5.0 - 5.5). The mother is herself an actor whose behaviour is intentionally directed towards establishing and maintaining a phatic link with her infant. The structures which develop in interaction with the inanimate environment differ from those developing in interaction with the animate environment. In the former the object itself does not undergo any changes, the subject's perception of it will however change. The following example will clarify this.

The stimulus object of a clock will assume different meanings at different ages. At one year the attention is on the moving hands or the tick, at five years on trying to relate the one hand to the other to reach a conclusion about the time 'the clock tells', as an adult the time is related to the broader context of what else has to be fitted into the time period that remains. It is obvious that the stimulus

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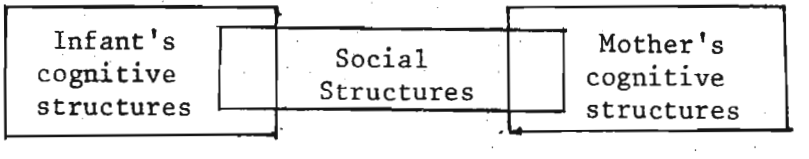
[1] Diagrammatically this interaction can be represented thus:



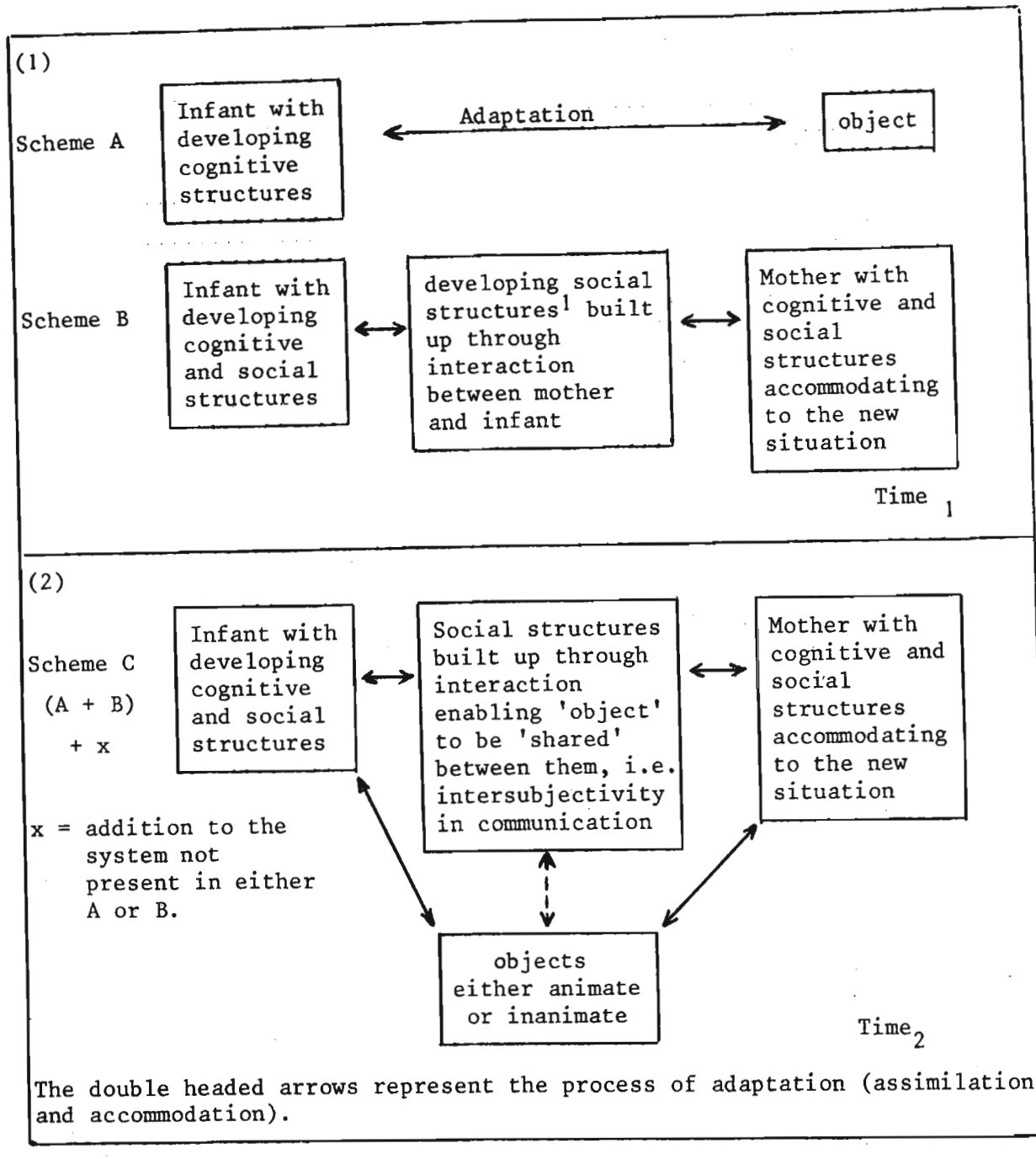


Figure 12 Diagram to Illustrate the Development of Social Structures.

[1] These 'social structures' (like the sensorimotor schemas which develop out of reflexes) originate in the interactions between the two individuals. They will be related to the biological capacities of the individuals but, because of their different functional levels (mother and infant) the biological constraints do not bear the same relationship to these social structures as they do to the evolving cognitive structure.

has not altered, what has changed are the cognitive structures of the individual and thus the interpretation of the stimulus.

A social stimulus, as has already been stated, is not inert but is actively engaged in interaction with the infant, stimulating as many perceptual modalities as possible (auditory, visual, tactile, kinaesthetic and olfactory) and, most importantly, making continuous appropriate adjustments to the infant's reactions. This sensitivity of action to reaction facilitates the development of social structures and thus leads to an increase in quality and quantity in the exchanges between the infant and the social environment, i.e. to adaptation of the social structures as assimilation to and accommodation of them occurs.

10.0 IN SUPPORT OF THE SELECTED METHODOLOGY.

"It cannot be emphasized too strongly that careful observations, which either arise from or lead to developmental theories, are a necessary precursor to measurement. Once a theory becomes sufficiently well developed to generate confirmable hypotheses, it becomes possible to devise tools and techniques which will measure the variables which are of central importance to the theory."

Elliott 1976, page 57.

This research approach would not conform to the critical stance which Hempel (1965) asserts underlies scientific enquiry. The assumptions of this critical stance are:

1. A theory must consist of statements which are about material phenomena and are verifiable in terms of their consistency with those phenomena.

2. Objects of interest to a particular theory are related in ways which can be expressed by statements of causality.

However, Sanders (1973) argues that these assumptions are not definitive of scientific enquiry *per se* but of a *class* of scientific enquiry which he has termed the classical paradigm. He suggests an alternative and more relevant paradigm for psychology to be the grammatical paradigm where the above assumptions do not apply. Operating within the constraints imposed by the classical paradigm limits the questions to which one may, as a scientist, address one's interest.

Support for a different approach in psychology from that of the natural sciences comes also from Medawar (1977).

> "If a broad line of demarcation is drawn between the natural sciences and what can only be described as the unnatural sciences, it will at once be recognized as a distinguishing mark of the latter that their practitioners try most painstakingly to imitate what they believe - quite wrongly, alas for them - to be the distinctive manners and observances of the natural sciences. Among these are:

> (a) the belief that measurement and numeration are intrinsically praiseworthy activities;
> (b) the discredited farrago of inductionism especially the belief that *facts* are prior to ideas and that a sufficiently voluminous compilation of facts can be processed by a calculus of discovery in such a way as to yield general principles and natural-seeming laws;
> (c) another distinguishing mark of unnatural scientists is their faith in the efficacy of statistical formulas, particularly when processed by a computer - the use of which is in itself interpreted as a mark of scientific manhood.
> There is no need to cause offense by specifying the unnatural sciences, for their practitioners will recognize themselves easily - the shoe belongs where it fits! "
> (page 13)

And from Shotter (1974) in an extremely interesting argument against the relevance of natural science methodology and goals in psychology.

This research has been conducted without the constraints of the classical paradigm. It has not been concerned with establishing causal relationships. It has been concerned, as was Piaget, with generating hypotheses and with description.

These general statements about methodology are argued specifically for developmental research by Trevarthen (1977).

> " Experiments on the abilities of infants to discriminate stimuli, to perceive objects in space, or to control reinforcement and learn have gained much ground in recent years. Now the specialists, even those who lean strongly to the empiricist philosophy, speak of the infant as highly competent - as endowed with complex functional abilities, and with outlines of much more in the way of *potentialities* for psychological action. Most of all, infant man is now seen as a sensitive and impressionable perceiver.
>
> Many reviewers and teachers speak loudly of the advantages of rigorous experimental procedure and of the great risks of description or anecdote. But, if one reviews this recent, highly fruitful period and awakening of interest in infant psychology it may be seen that the art of the new experiments is in letting

infants express themselves more naturally, and in recording their choice of reaction more directly than before. Unfortunately, when controls and recording devices are set up to obtain quantitative data on a restricted range of questions, the findings may give a distorted view of infant intelligence. Putting an accent on discrete problem-solving and task-perceiving powers of infants, both problem and task being set by the experimenter, as well as emphasis on conditioning as a mechanism for developmental change, have obscured the spontaneous, innate aspects of infant behaviour, by which the mind of an infant regulates its own growth in more complex circumstances. This was, of course, clearly stated long ago by Piaget in his criticism of the behaviourist approach to the development of intelligence (e.g. Piaget, 1950).

What is found out by experiment answers logical questions about the preferences or limits of intelligence one by one. Experimental technique is always selective. If the questions are well posed, and if the techniques for channelling the activity of the subject to answer each question are well chosen, then the findings permit sound inferences of what may happen in the infant's brain. But there is always a danger that the experimenter will not know the differences between a genuine correspondence of *his* purpose with the functions of the "subject" and a spurious or trivial coincidence between them, a coincidence which misleads about what the infant was doing when he formulated acts to the stimuli in some consistent measurable way.

For example, if differential orienting responses are obtained to two stimuli, which stimulus dimensions and what features of the temporal occurrence or change in the stimuli are important to the infant perceiver? A constellation of tests may clarify this question. Invariably, when this is done, the answers have been surprisingly complex, the infant showing himself to be making elaborate integrative reactions to events, and guiding his perceptual development by asking progressively more complex questions of the world in which he acts (Bower, 1974). Then, how do ordinary infants employ a demonstrated ability in a world where those precise stimuli may never occur like that? Is information about changes in the frequency of a response (on which inferences about learning, habituation, etc. always depend) relevant when that particular act never occurs, at least not isolated in that way? What is the importance of unnoted and unreported acts of complex regulated form which accompany the one repeating movement or reaction that has been chosen by the experimenter as the measured response?

Usually these and other questions about integration are not answered by selective experimentation. A literature composed of hundreds of studies of one question at a time produces a disintegrated impression. This is not to say that experimental technique is invalid or that it may be dispensed with to gain understanding. It does indicate, I believe, that a different kind of research, less analytical *at the start* is a necessary complement to experiment in scientific study of intelligence, especially for the early developmental stages when great impressionability of memory is controlled by innate forms of action. This alternative method attempts to capture regular patterns in spontaneous action and tailors experimental intervention to what is discovered, to determine how the activity may change to overcome an obstacle, avoid an impasse, transform a less favourable situation into one in which it is well adapted, or how behaviour may be completely reformulated to create a new kind of opportunity. The essential difference resides in an emphasis on generative or structural and functional complexity in the subject who thus becomes a free-acting agent. (...)

Growing biological systems have one unique property which is paradoxical in comparison with non-living systems to which they are often compared for purposes of experimental analysis. They predictively generate structures as a means for transforming function. Any immature organism will show organs in a strange anticipatory state of adaptation, with intrinsic organization in excess of essential function at that time. This prefunctional determination of parts, much of which is invisible or ultra-microscopic, is essential for development - it is what drives the process along a predictable plan or course, often in opposition to circumstances.

To observe this kind of predetermination in developing psychological systems is very difficult because the prefunctional and generative components are, generally, not known. They cannot be identified as physical elements in the brain. We must see them indirectly, reflected in the dynamics of psychological action. Organization of percepts in a coherent space referred to the body and detection of stable objects in space can only be inferred from what infants do in selective response to complex changes or patterning of events in the stimulation around them. Any elementary movement of an infant is evidence of psychological control of action only if it is seen in dynamic combination with many other movements.

(...)

> Human communication is not simply a matter of reacting to sign stimuli or to conditioned stimuli. It is a highly controlled and co-operative spontaneous use of a large number of muscles of expression. It transmits and responds to mental or subjective information - information about feelings, intentions and the contents of awareness. The most significant movements of expression, such as those of the face, are uniquely adapted to affect other persons, but communication is also furthered by perception of the direction, intensity and plan of co-ordination inherent in any purposeful movement. We must therefore look, first, for special expressive movements in infants like those of adults, second, for sensitivity of infants to these movements when adults make them and, third, for awareness of the purpose of movements made by others towards objects."
> (pages 227-233)

One further area in which defense of method may be considered necessary is that of small sample size. The study was conducted on a few mother-infant pairs, each pair being observed over a period of at least six months. The use of small numbers is not unique; it is conventional in linguistics and was Piaget's method. However, its validity needs supporting.

All the infants are going to speak English and to behave in the manner appropriate for a member of an English speaking society and are being, from birth, taught to speak by an English speaking mother. Thus each infant is, so to speak, being constructed to follow the same set of rules as all other 'English' infants, which each will ultimately acquire. Any mother will be teaching the same rules to her infant, and in this respect all mothers are equivalent; thus a few are as good as many for the purposes of this research. And, because of this, each infant will encounter similar problems and will, by virtue of her species characteristics, solve them in the same general way. Although there will be individual differences (which are not the concern of this research) the findings are, in the above sense, generalizable to others in the same culture.

Within each infant the problem of generalization is not difficult, for the videotapes provide a large corpus of communicatory episodes sampling

all (or most) communications occurring under the observational conditions.

Piaget is the most noted developmental psychologist to have worked with small samples. He too was concerned with the generation of, rather than the confirming of, hypotheses. Amongst linguists language from a single subject (very often the linguist himself vide Chomsky 1965) is the norm. Ethologists too depend upon observational studies, often of small numbers, in natural environments to generate hypotheses which are then more rigorously tested. At this point, larger samples and more controlled conditions may be required. But this follows the naturalistic observations which generated the hypotheses.

SECTION II

11.0 COLLECTION OF DATA AND RESULTS.

11.1 INTRODUCTION.

As has already been stated, the theories of Jean Piaget (1952, 1953, 1970a, 1971a, 1971b) and John Searle (1969) provided the theoretical framework for the presentation and analysis of this research data. Concepts from these theories will be used without additional definition or argument than that given in the theoretical section which preceded this.

Details of the sample, methods of data collection, techniques of analysis and the rationale for the methodology will precede the presentation of the data.

Qualitative changes in the interaction of mother and infant will be described and their relevance to the ontogenesis of communicative competence made explicit. The data for each dyad is presented chronologically; no attempt has been made to match the chronological age of the infants at the overlaps, the deciding criterion was that the stage of interaction[1] which had been reached was equivalent.

11.2 DETAILS OF THE SAMPLE.

Three mother-infant pairs provided the quantitative data for this

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[1] These stages are presented on pages 132,133, 201, 202.

report. To date six mother-infant pairs have been filmed and the tapes viewed and discussed. The qualitative information and the development of techniques derive from this larger sample. The three mother-infant pairs who have provided the quantitative data are listed first.

1. Name: Julie
   Sex: F
   Date of birth: 28/2/76
   Age when recording commenced: 00:00:01
   Age when recording discontinued: 00:34:06

2. Name: Sarah
   Sex: F
   Date of birth: 3/4/1975
   Age when recording commenced: 00:23:05
   Age when recording discontinued: Still in sample - last film analysed 01:04:00

3. Name: Kerryn
   Sex: F
   Date of birth: 4/6/1974
   Age when recording commenced: 00:42:00
   Age when recording discontinued: 02:02:02
   Last film analysed: 01:17:00

4. Name: Oliver
   Sex: M
   Date of birth: 17/11/1973
   Age when recording commenced: 01:15:04
   Age when recording discontinued: 01:41:03

5. Name: Ian
   Sex: M
   Date of birth: 39/7/1975
   Age when recording commenced: 00:15:01
   Age when recording discontinued: 00:34:03

6. Name: Jolene
Sex: F
Date of birth: 24/7/1974
Age when recording commenced: 01:03:06
Age when recording discontinued: 01:19:06

There was no attempt to obtain a sample representative of any section of any population. All that was required were 'normal' infants with 'normal' mothers[1]. Kerryn, Oliver, Jolene and Sarah were talking normally by the end of their participation in the study. Julie and Ian are too young but their development in all respects appeared normal.

The selection of females for the detailed data analysis was not planned. It was dictated by the ages of the infants and the periods for which they had been filmed. The case study nature of this research did not seem to preclude this selection. Subjects were recruited from friends of colleagues. The frequent attendance at the University for a long period of time dictated that we select subjects living in proximity to the University.

The subjects selected provided a quasi-longitudinal sample with the age range extending from one day of age to two years of age. Overlaps in their ages ensured a continuity in the analysis although individual differences in both mothers and infants were obviously present. The stages of the development of communicative competence which will be outlined provided a further criterion which was used to assure continuity. Each dyad provided longitudinal information within the age range covered by that dyad.

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[1] 'Normal' here means not deviating markedly from the mode of the population.

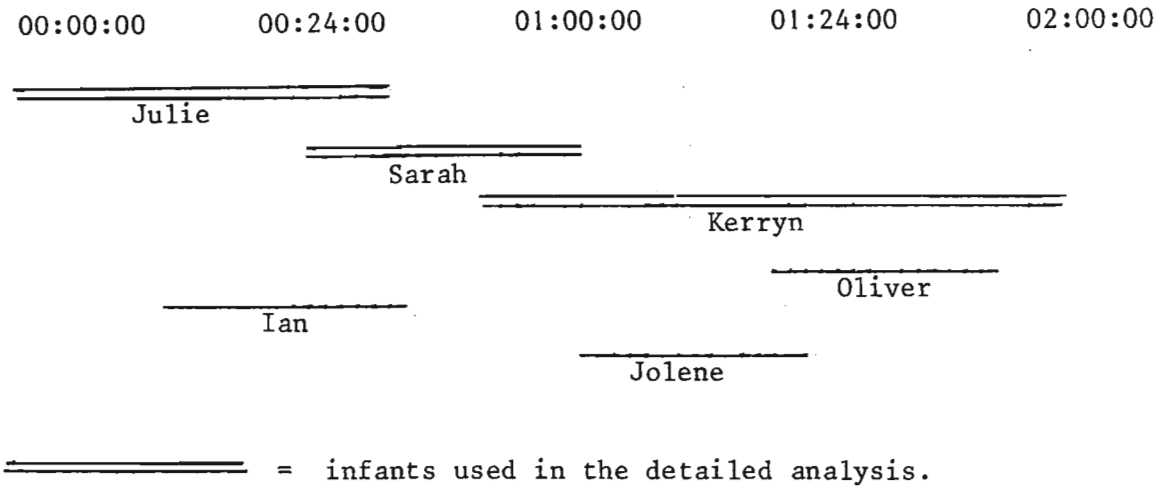


Figure 13 Diagram to show Age Overlaps.

11.3 COLLECTION OF DATA.

Recording was undertaken in the Nursing Home from day 1 to day 7. The feeding period was selected because this was the time when the infants were brought from the nurseries to the mothers.

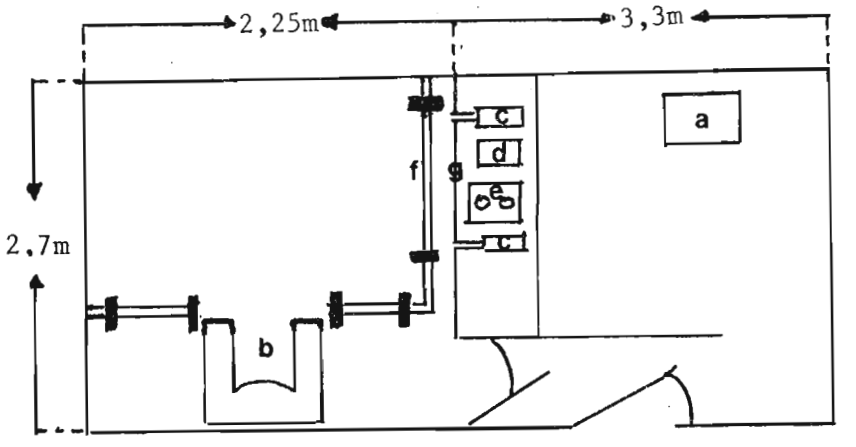
From 1-15 weeks recordings were collected approximately weekly at the infant's home. These situations were unstandardized and, unfortunately, not all of them involved interaction. On three occasions the infant was sleeping when the observer arrived to make the recordings. The recording up to this point was done with the observer in the room with the mother and infant.

From 15 weeks onwards the infants were brought by their mothers at two-

weekly intervals to a playroom in the Psychology Department, University of Natal.

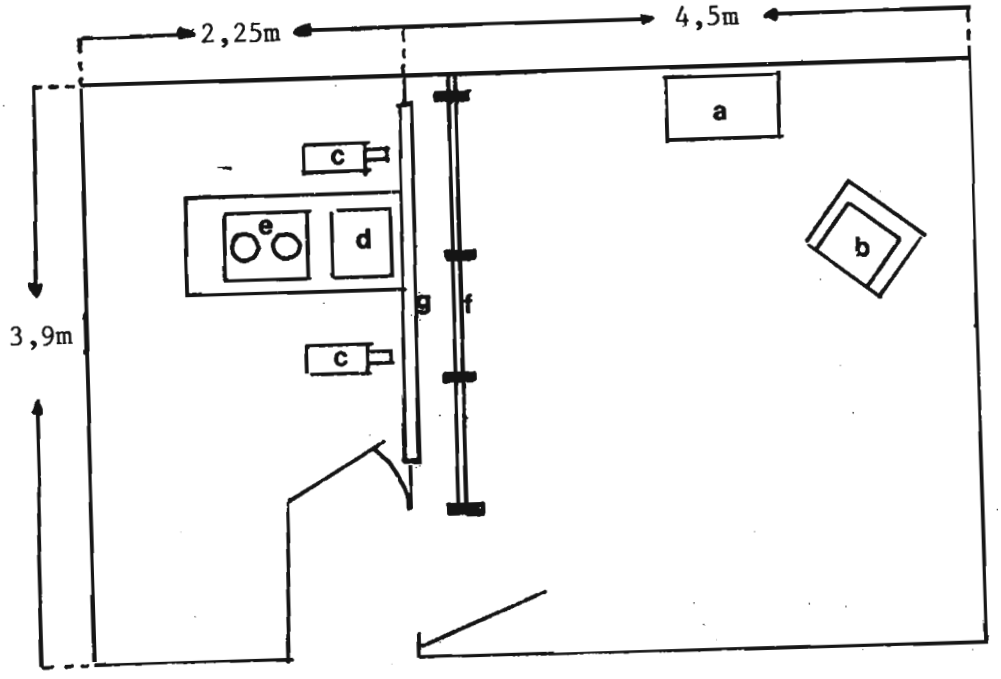
11.3.1 Details of Developmental Laboratories (Playrooms).

Two laboratories were used. The first was a temporary one and far from ideal. The observation room was not soundproof and the cameras projected into the room. This was a source of distraction to both mothers and infants. The sound recording was frequently distorted by extraneous noises and the room was small. Figure 14 gives the dimensions and layout of the room.



a table
b chair
c camera
d wiper and monitor
e videorecorder
f wooden barrier
g one way mirror

Figure 14 First Laboratory.



a table
b chair
c camera
d wiper and monitor
e videorecorder
f wooden barrier
g one way mirror

Figure 15 Second Laboratory.

The second playroom, Figure 15, soundproofed and isolated from the observation room has enabled better quality recordings to be made. The quality of audio recording was still not good enough to enable accurate phonetic analyses to be made. All recording sessions lasted for ten minutes.

The toys in the playroom, which were selected with no special plan in mind, proved to be a fortuitous collection. All these toys, stacked on a rack, were available at each recording session. The mother or

infant or both could select any or all of the toys during the session.

1. Ring toy*
2. Cup toy*
3. Hammer toy*
4. Blocks

} These are all construction toys enabling joint or individual play

5. Books x 3
6. Wooden train
7. Wooden cement mixer with removable driver
8. Wooden log transporter with removable driver

} Both referred to as 'lorries' in the description

9. Plastic truck
10. Large plastic ball
11. Squeaky doll
12. Three rag dolls
13. Plastic duck
14. Plastic dog

The availability of a standard set of toys enabled the sequences of the development of skill both joint and individual to be followed and comparison between levels of development of the different infants to be made. The construction toys were ideal for the development of joint action games requiring increasing motor skills and co-operation between mother and infant.

11.3.2 Details of Recording Equipment.

As has already been stated, facilities for video recording were developed during the research project. As the needs of the research became evident, the audiovisual equipment with which the project was commenced was replaced with improved equipment. A brief description follows.

All the Nursing Home and home recording was with a Sony portable VTR (AV-3420 CE) taking a ½" half hour tape. The camera was a modified

* Illustrations of these toys appear in Appendix II.

National W.V. 85E portable. This equipment was used initially for the recording in the studio as well. It soon became apparent that with the more mobile infants two cameras were necessary, one to track the mother, the other the infant. To this end a Sony video camera wiper CMW 110 CE was obtained providing an optional split screen recording which could be switched on when required.

In July 1976 the new recording complex came into operation. The equipment in this laboratory was a Sony AV 3670 CE slow motion VTR, two Sony AVC 3250 CE studio cameras, Sony CMW 110 CE wiper, four-microphone recording unit, video tuner VT6-33, three Sony 9" monitors PVM-90 CE, and a Grass Model 5 Polygraph for event analysis.

The range of equipment has again been extensively expanded and improved providing excellent conditions for recording.

11.4 THE PROBLEM OF ACCURATE AND RELIABLE OBSERVATION.

All the descriptions contained in this report were made by the author. In the initial period of this research considerable time was spent on developing accuracy in observation and description. This training took the following form: At least two observers would view the videotape and describe the interactive sequence. These descriptions would then be compared. Discrepancies were checked by referral to the videotape. Observers were regarded as adequately trained when no discrepancies in compared descriptions were present.

The facility of slow motion viewing of the record enabled detailed and accurate descriptions to be made. Also, videotape enables one to replay as frequently as necessary any episode and it is therefore possible to check on the accuracy of one's own observations. Such checks were performed on a random selection of the descriptions of the interactive sequences - no important differences between the descriptions

were observed. In excess of one thousand hours were spent in viewing, describing and analysing the videotapes.

11.5 TECHNIQUES OF ANALYSIS OF DATA.

To deal with this extremely complex data various techniques were developed. Because one is dealing with a developing organism and an emergent social unit, the techniques had to be flexible and sensitive. It was found to be impossible to apply only one analytical technique. This is to be expected, for, as Flavell (1977) states:

> "If we are presented with a newborn infant, a two year old infant and an adult ... and our task is to pick the one that seems most different from or unlike the other two as a thinking and knowing creature, that is as a cognitive organism, I would definitely select the neonate as the odd one out. For despite the obvious and undeniable intellectual differences between the two older members of the trio, they both strike us as being endowed with 'minds' ..."
> (page 15)

There is an obvious difference in the behaviour of the neonate and the behaviour of the infant of a few months of age. The former is a system which appears to be almost entirely mechanistic whereas the older infant conforms more closely to what one would classify as an organismic/ intentional system. This difference dictated that different techniques were appropriate at different ontogenetic stages. As the very limited behavioural repertoire of the neonate rapidly expanded so different aspects of the interaction became relevant. There is an important change in the quality of interaction from stage V of the postulated developmental sequence (the infant approximately 01:02:00). It is at this stage that a modification in the form of the analysis of the descriptive data was introduced.

The analysis up to this stage takes the following form:

No.	$M/_I$	AGE STAGE Description	$mn/_{mnn}$	P,I,II III	Coded Beh.	Approp.

The column headings abbreviate the following:

No. Number of the element in the communicative record. This permits reference to specific elements.

$M/_I$ Refers to whether the actor is the mother (M) or the infant (I).

Description is the description, in ordinary language, taken from the videotapes.

$mn/_{mnn}$ Refers to the distinction already discussed made by Grice (1957) between $meaning_n$ and $meaning_{nn}$.

P,I,II,III refers to the type of communicative action. Whether it is regarded as

P - merely maintaining the Phatic Channel, where there is no intention evident to elicit a specific effect on the recipient.

III - stands for a Pre Speech Act as defined on page 105.

II - stands for a Primitive Speech Act (Dore 1972) as defined on page 104.

I - stands for a Speech Act (Searle 1969) as defined on page 87

The subscripts to the communicative action refer to the glosses listed

in Appendix VII. Glosses define, in a more specific manner than the major Function[1], the nature of the communicative action. Thus I_{24} would be interpreted as a speech act in which information was requested from the hearer; III_1 as a Pre Speech act in which an object was requested from the hearer.

It is interesting, and will be evident in the text, that the mother does not expect many of her speech acts to be understood by her infant; they are merely commentaries on her own or the infant's ongoing activity. This is evident in the analysis of mothers' speech reported by Hoar (1977) and would account for the simplification in mothers' speech which occurs sometime towards the end of the first year of the infant's life when the infant's understanding of the verbal content of communicative acts is expected.

Coded Beh. refers to coded behaviour.

When the infant is very young, up to the end of stage IV, the only behaviours which are coded are the direction of gaze, the presence of vocalizations or verbalizations and the presence of smiles, because it is these which are the most relevant to communication[2].

Examples of the coded behaviour are as follows:

$+gs//_g$ which would be interpreted thus:

smile, looks at object held by partner or at partner's extended hand then looks at object in the joint game.

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[1] See page 207 for a discussion of this.

[2] These, in the later analysis are classified as action modifiers (see Appendix VI) and appear as subscripts to the major action categories. These action categories abstract the prominent features (in terms of communication) from the total action pattern.

Approp. Refers to whether the reaction of either of the individuals in the dyad was appropriate to the situation, this is scored with a √ for appropriate reactions.

Another technique used was event recording of certain behaviours and actions which were assumed to be important in the establishment of communicative competence. The majority of event recordings were made on a four channel polygraph[1]. This data did not prove to be as useful as was first anticipated because, as has already been stated, to understand or record communicative acts the appropriate units of analysis are actions, not movements. The quantitative data has complemented some areas of analysis but the technique of event recording has been supplementary rather than primary.

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[1] Examples of the event recordings appear in Appendix III.

12.0 THE DEVELOPMENTAL SEQUENCE.

In the presentation of data, the emphasis will be on seven stages of development which precede the appearance of Primitive Speech acts. Interactive sequences will be described in detail and analysed up to and including stage IV according to the protocol outlined. The functional analysis (from stage V) will be outlined later.

The developmental sequence which is reported was obtained by frequent scanning of the tapes. The identified stages were then described in detail and examples from each stage have been given in the text.

12.1 THE IMPORTANCE OF GAZE IN EARLY INTERACTIONS.

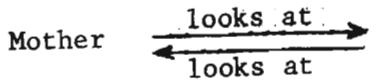
The centrality of eye contact between the mother and infant is obvious to any careful observer of mother-infant behaviour. It retains importance until objects enter their shared world; from this time the mother's visual attention alternates between the objects she is presenting to the infant and the infant's face. She is in effect monitoring the success of her introduction. It would seem that if the mother can control the infant's attention then she feels that she is, in some way, in communication with her infant (that there is a phatic channel present between them).

12.1.1 The Developmental Sequence up to the Establishment of Intersubjectivity.

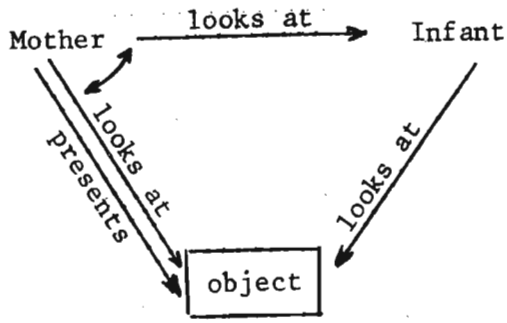
Schematically the first part of the developmental sequence can be represented thus:

Stage I Mother —looks at→ Infant ⇉ Infant's attention highly distractible

Stage II

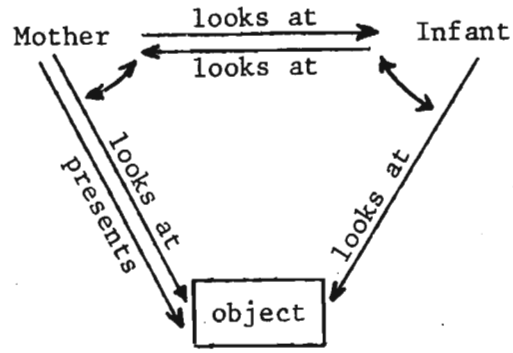


Stage III



i.e. alternation of mother's gaze between infant's face and presented object.

Stage IV



i.e. both mother and infant alternate their attention between each other and an object. In some sense the object can be said to be 'shared' between them.

12.1.1.1 Stage I.

Dyad 1: Julie and mother.

At birth the infant's attention was not random. It has been shown that there is a selective preference by the infant for social stimuli[1]. However the infant's attention was easily distracted. Of importance in the early interactive sequences is the amount of attention the mother pays to the infant. Even when not looking at the infant's face she frequently examined hands, feet or head of the infant. There was also frequent vocalization and verbalization from the mother. From the record of a ten minute feeding situation when Julie was 00:00:01 old it

[1] See 5.4.2

was noted that the mother spent 75% of the time in which her face was visible on the record, looking directly at Julie. Although Julie's eyes were open for 68% of the ten minute session at no time did she appear to be looking at the mother. This may have been an artefact of the feeding situation and of the mother's inexperience[1]. During the session the mother made 34 vocalizations, the infant none. The mother also touched (stroked, kissed, examined the hands, etc.) Julie 23 times. Thus, although the infant was relatively inactive, the mother directed a lot of attention and activity towards the infant: however, although the mother did focus so much attention on the infant there was no evidence in this first episode of her attempting to establish eye contact with her infant. Within a few days eye contact became increasingly important in structuring their interactions. Because of its importance it has been designated a target behaviour. The ability to establish and maintain joint visual regard marks the appearance of stage II of the developmental sequence.

Various techniques were adopted by the mother in attempting to gain eye contact with her infant. The most frequently used were:

1. Holding the infant directly in front of her face or placing her face directly in front of the infant's. This was seen as early as 5 days and was initially one of the most successful methods. It declined in importance as other techniques become increasingly effective. In terms of achieving its goal, it was so effective because it reduced the alternative behaviours in which the infant could indulge. To prevent eye contact the infant could either turn its head or shut its eyes[2].

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[1] The mother was a primapara and appeared extremely nervous in her handling of her infant. If she had felt more at ease she would probably have moved the infant around more freely: as it was the infant spent most of the ten minutes being rather rigidly held by the mother.

[2] The fixed focal length of the neonate contributes to the efficacy of these methods; the background would be out of focus and therefore not as attractive.

2. The mother adjusted her position so that her face was in the mirror plane of the infant's - she frequently did this when the infant was lying down.

3. Another technique was to insert her face between an object at which the infant was staring and the infant's face. This occurred during instances of obligatory attention being displayed by the infant.

4. The mother would touch the infant to gain its attention. In the small infant the area most frequently stimulated in this manner was the peri-oral area. Frequently this was accompanied by verbalizations such as: "Smile for us", "Give me a smile".

5. Another technique often associated with one or more of the above was calling the infant either by name or using endearments. Typically these were used with a rising then falling intonation (∧).

Once eye contact had been achieved the mother, by vocalizing and movement attempted to maintain it. Verbal games became a common feature of interaction in stage II and during the transition from stage I to stage II.

The interactions recorded between mother and infant during the first few days of the infant's life were limited because the infant was only brought out of the nursery for feeding and was not left with the mother for prolonged periods. However, as is evident in the following short episode, an order was already apparent as early as 00:00:05.

No.	M/I	AGE 00:00:05 STAGE I Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	M	Sitting up in bed holding Julie in front of her.				
2	I	Crying.	M_n		V_c	
3	M	"And now, are you starving? Are you starving?" Looking intently at Julie.	M_{nn}	I_{24}	W_s	✓
4	I	Stops crying momentarily and looks at mother. Then begins to cry and continues.	 M_n	P	 V_c	✓
5	M	"All right, all right. See what I mean?" Begins to undo her nightie. Imitates crying noises being made by the infant. Maintains gaze at infant.	M_{nn}	I_{25} III_{23}	W_s V_s	✓
6	I	Stops crying, glances at mother, then away.		P	V_s	✓
7	M	"Ooh, goodness gracious", as she fixes child to the nipple.	M_{nn}	I_{17}	W_s	✓

Already there was evidence of a temporal patterning in the interaction. For example, in elements 4 and 6 the infant stopped crying when the mother talked to her. There were two incidents of very brief "joint attention" evident in elements 3 and 4, and 5 and 6. Also of interest was the mother's interpretation of the infant's signal, i.e. "Are you starving?", the imposition of non-natural meaning onto a natural meaning (elements 3 and 5).

12.1.1.2 Stage II.

No.	M/I	AGE 00:02:01 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	M	Picks up sleeping infant and lays her on the table to change her nappy.				
2	I	Wakes up - looks at mother.		P	S	✓
3	M	"You're a funny little thing, hey, aren't you?" Leans over the infant, looking directly at her, touches her chin. "Why are you so funny, hey?"	M_{nn} M_{nn}	I_{26} I_{26}	W_s W_s	✓
4	I	Moves head slightly, still looking at mother.		P	S	✓
5	M	Moves head to maintain the mirror plane.		P	S	✓
6	I	Hands/arms begin a rhythmic circling movement, maintains gaze at mother's face.		P	S	✓

In this sequence, recorded nine days later, there was evidence of joint visual attention (elements 2-6). The mother employed several techniques to maintain the eye contact:

Verbalization (element 3)
Moving head (element 5)
Touching the infant's face (element 3)
Leaning over the infant (element 3).

In this next observation, recorded two weeks later (00:04:03), the interaction still conformed to stage II of the developmental sequence, however a few features warrant emphasis. The mother's actions were, on some occasions, related to her varbalizations: "Smile for us", while touching the infant's chin (element 4); "Kick", while pedalling the

infant's legs. The flexibility of the mother's behaviour and the ease with which she changed from one behaviour to another are an indication of how carefully she monitored her infant's behaviour and adjusted her behaviour accordingly (elements 2, 4, 8).

No.	M/I	AGE 00:04:03 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	I	Lying on the table without a nappy on. Legs moving in a circular paddling-continuous movement. Looking at mother.		P	S	
2	M	Leans forward into the mirror plane. "You kick nicely, don't you?" "You kick". Turns away to put cream onto Julie's bottom. "You're very quiet today" Leans over in front of Julie - faces in the mirror plane. "Come on kick".	M_{nn} M_{nn} M_{nn}	I_{17} I_{26} I_{11}	W S W S	✓
3	I	Continues the paddling leg movements, arms now moving in a rhythmical circular manner as well. Maintains gaze at mother's face throughout the following:		P	S	✓
4	M	Takes hold of Julie's feet, looking at Julie. "Kick, kick, kick", as she moves Julie's legs in a kicking motion. Repeats this sequence. Bends forward, touches Julie's face. "Hey smile for us. Smile for us". Moves slightly backwards and	M_{nn} M_{nn}	I_{17} I_{11}	W S W S	✓

No.	M/I	AGE 00:04:03 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
		repeats the kicking movements, holding both Julie's feet, but does not vocalize. Lets go Julie's feet, leans forward over her, faces in the mirror plane. "Smile for us, come on", as she touches Julie's face with her right hand. Takes hold of Julie's feet again and repeats the "Kick, kick, kick" sequence looking intently at Julie's face.	M_{nn} M_{nn}	I_{11} I_{17}	W_S W_S	✓
5	I	No change in expression.		P		✓
6	M	Lets go Julie's feet, calls "Hey Julie", takes the child's hands and tempts her to sit up.	M_{nn}	I_{19}	W_S	✓
7	I	No change in expression.		P		✓
8	M	Takes hold of her feet again - looks at Julie's face which is unresponsive. Lets go of her feet and turns away.	M_n	III_{10}	s//	✓

The introduction of a complex 'unit' or round of behaviour (the kicking game, elements 1-4) is important because this type of interaction facilitates the establishment of $rules_r$, $rules_c$ and co-ordinations and also contributes to the development in the infant of representation[1]. The mother's attempt to get the infant to sit up (element 6) is an example of another feature of mother-infant interaction, that mothers frequently encourage their infants into new actions, thus extending

[1] As used by Piaget, the separation of signifier and signified, discussed in 6.3.3.

the infant's behavioural repertoire and the social structures which are developing between them. In Piagetian terminology, she coaxes the child into a state of disequilibrium, where, for assimilation to be achieved an accommodation of the existing schemes is necessary. In this episode it is clear that the mother was using eye contact as the cue for introducing other and increasingly complex social interactions which involved reciprocity of the roles of recipient and actor.

No.	M/I	AGE 00:04:03 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	M	Holding Julie over her shoulder.				
2	I	Eyes wide looking directly at the observer, body tense.			go	
3	M	Looks over her shoulder at Julie's face. "What's that? What's that?" Kisses Julie's head. Looks again at Julie's face.	M_{nn}	I_7	Ws	✓
4	I	Maintains fixed gaze.			go	
5	M	Begins to move infant around watching Julie's face. "Aren't you a clever girl, aren't you?"	M_{nn}	I_{26}	Ws	✓
6	I	No apparent reaction, maintains fixed gaze.			go	
7	M	"Such a big strong girl". Watching Julie's face (presumably because of Julie's tense position, holding herself away from the mother's body). Again sttempts to get the infant's attention, turning her	M_{nn}	I_{26}	Ws	✓

No.	M/I	AGE 00:04:03 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
		head further over her shoulder and close to Julie's face. "Are you a big strong girl?"	M_{nn}	I_{26}	Ws	✓
8	I	No expression change. Unblinking attention remains fixed on observer.			go	
9	M	Looking at Julie's face. "Hey Baba". Laughs. "Who's that?" Touches Julie's face with right index finger. "Hey smile. Give us a nice smile".	M_{nn} M_{nn} M_{nn}	I_{19} I_{7} I_{11}	Ws Ws Ws	✓
10	I	Fixed unblinking attention maintained.			go	
11	M	Takes hold of the back of Julie's head and attempts to get her own face between Julie's and the object. "What are you looking at?" Leaning Julie back on her arm. Turns Julie's head towards her. "Whoops" "Whoops" Lets her head go.	M_{nn}	I_{24} III_{18}	s Ws Vs	✓
12	I	Returns to fixed attention at observer.			go	
13	M	Laughs. "Whoops. She's got the stares. What are you looking at then?" Watching Julie over her shoulder. Kisses Julie's hand.	M_{nn}	I_{26}	Ws	✓
14	I	Retains fixed attention.			go	
15	M	"Okay". Walks towards the table and lays Julie down. "Put you down."	M_{nn} M_{nn}	II_{26} I_{18}	Ws W	

This is an excellent example of fixed or obligatory attention (Stechler & Latz 1966) (elements 2-15). It illustrates the importance of gaze direction in focussing attention of both partners on one object. In this case (elements 3, 9, 11, 13) the mother's attention on the objects was apparent through her reference to them, not her visual attention on them. The mother did not introduce the object, her aim was not to get the infant's attention onto the object but in fact to redirect the infant's attention from the object onto herself (elements 5, 7, 9, 11, 13). The mother used the following techniques in her attempt to redirect the infant's attention:

1. Talks to infant (elements 3, 5, 7, 9, 11, 13).
2. Kisses/touches the infant (elements 3, 9, 11, 13).
3. Moves the infant's position (element 5, 11, 15).
4. Attempts to come between the infant's face and the object (element 11).
5. Calls infant (element 9).
6. Attempts to generate an alternate activity (element 9).

No behaviour exhibited by the child during this sequence indicated that she was reacting appropriately to the mother.

Bruner (1969) asserts that the phase of obligatory attention lasts from approximately six to approximately sixteen weeks[1].

The significance of this behaviour, so different from the diffuse distractability which preceded it is that the mother can now comment on and act on objects often visually selected by the infant and thus draw these objects into a shared sequence.

This obligatory attention phase coincides with the introduction of objects to the infant by the mother.

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[1] Julie's display of this behaviour two weeks in advance of the age limits defined by Bruner does not pose a problem (see 5.3). As in all chronological age limits, the limits are averages and wide variation is to be expected.

No.	M/I	AGE 00:07:05 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	I	Sitting on mother's knee, gaze fixes on her own hands which are moving randomly.				
2	M	Patting Julie on the back, winding her during a bottle feed. Watching Julie's face, notices Julie's gaze direction.				
		"There's your hand". Lies Julie back against her arm.	M_{nn}	I_7	$Ws//_{gf}//_{s}$	
		Takes hold of Julie's left elbow with her right hand. "There's your hand". Holds it up in front of Julie's face. "Can you see? Can you see?" Alternates gaze from hand to Julie's face. Lets go hand.	M_{nn} M_{nn}	I_7 I_{24}	$Ws//_{gs}//_{s}$ $Wg//_{gs}//_{s}$	✓
3	I	Looks intently at her hand. Moves her arms again, her hand brushes against her head.			gp	✓
4	M	Laughs. "Little worm". Leans back against the pillows and holds Julie against her breast. Stretches over to pick up the feeding bottle. Watching Julie closely.	M_{nn}	I_{26}	$Ws//_{g}//_{s}$	✓
5	I	Again gazes at her left fist as it moves into her field of vision.			gp	
6	M	"That's yours", looking at Julie. Transfers the bottle from her right to her left hand. Touches Julie's left fist with her right	M_{nn}	I_7	$Ws//_{gs}//_{s}$	✓

No.	M/I	AGE 00:07:05 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
		hand, looks at Julie's fist. "Yours". Transfers bottle back to her right hand and starts to feed Julie. Looks at Julie's face.	M_{nn}	II_7		
7	I	Julie's mouth opens prior to the bottle reaching it. Left hand comes into contact with the bottle and remains there. Gaze is now directed at mother's face.		P	s	✓
8	M	Chuckles - looking at Julie. Moves her hand holding the bottle carefully until it comes into contact with Julie's hand.		P	Vs	✓

This was the first time that the mother had introduced an object to the infant. It is significant that it was

(a) a part of the infant's body which enabled attention to be directed onto the object by stimulating more than one modality (the visual and tactile);

(b) it was an object to which the infant was paying visual attention prior to the mother's purposeful introduction of it (elements 1, 5).

The mother talked to Julie while presenting the object (her hand) and moving it (elements 2, 6). The verbalizations were appropriate, the object was named twice (element 2). Seven deictic words were used ('There's' x 2 (element 2); 'your' x 4 (elements 2, 6); 'that's' x 1 (element 6)). The mother's attention alternated between Julie's face and her hand (element 2, 6). Julie's gaze did not show these alternating attention patterns. When recommencing feeding there was no attempt by

the mother to visually present the bottle (element 6). It would seem that this bottle feeding was an action scheme which had developed between them and, because there were no unusual or novel elements in the scheme, there was no need to specifically draw the infant's visual attention to the object. Julie did open her mouth before the bottle reached it so one can infer that she had seen the bottle and fitted it into a context of action. This can be regarded therefore as evidence of signification.

Although an object (Julie's hand) was presented to her in this episode, this is insufficient evidence to assume that stage III had been achieved. Objects were not again presented to Julie until she was sixteen weeks old. On this occasion the object was Julie's foot. From eighteen weeks the presentation of objects became an important feature of their interaction and it is at this point that one can assume stage III functioning. It would seem that the appearance of this object presentation at seven weeks was a premature and isolated example of what will later become the norm. This can be regarded as a horizontal decalage (Piaget & Inhelder 1969). Other features of the interactions in this period (from seven weeks to eighteen weeks) show features of development which will contribute to stage III interactions, for example 'loosening' of attention, and an elaboration of the social structures.

No.	$M/_I$	AGE 00:07:05 STAGE II Description	mn/ mnn	P,I,II III	Coded Beh.	Approp.
1	M	Removes the bottle from Julie's mouth. Sits Julie up.				
2	I	Hands begin to flail around.				
3	M	"You're a big fat tick". "You're a big fat tick". "A big fat tick". Turns Julie to look at her and then puts her over her shoulder to wind her. Nuzzles her in the neck.	M_{nn}	I_{26}	Ws//	✓

No.	M/I	AGE 00:07:05 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
4	I	Lifts her head off mother's shoulder, eyes open.				
5	M	Moves Julie from her shoulder and holds her, against her knees, in front of her. Eye contact established.		P	s	✓
6	I	Looking directly at mother, smiling.		P	+s	✓
7	M	Talking softly to Julie (indistinct) nodding her head, making exaggerated mouth and eye movements, smiling. Touches Julie's cheek and chin. Maintains eye contact.		P	w+s	✓
8	I	Left hand moves rhythmically in a circular motion. Gaze directly at mother's face. Then makes lip smacking movements, tongue protruding slightly.	M_n	P	+s	✓
9	M	Smiles. Leans over in front of Julie. "There's no porridge today. Do you want some porridge?" Imitates the lip smacking.	M_{nn} M_{nn}	I_{17} III_{23}	w+s	✓
10	I	Again makes lip smacking movements. Smiles broadly. Maintains eye contact with mother.	M_n	P_{23}	+s	✓
11	M	Smiles. Lays Julie on the bed and rearranges the blanket around her.				✓

It is interesting that in this episode, for the mother at least, certain actions of the infant have a representative function (element 9). The mother's responses were in terms of her interpretation of the infant's action and, assuming the existence of social structures for her, these were appropriate and predictable and would elicit a similar response from her whenever displayed by the infant in the appropriate context. This would facilitate the infant's 'entrance' into an intersubjectivity with the mother. The predictability with which actions of Julie's are reacted to by the mother would influence the establishment for Julie of relationships between action and reaction. For example, Julie cries, mother picks her up and feeds her. Thus the cry will come to 'mean' feeding to both Julie and mother.

The mother interpreted Julie's mouth movements as a request for porridge (element 9). Her imitation (element 9) of these movements was imitated by Julie (element 10) prolonging the interaction and developing imitative skills in the infant. As has already been mentioned imitation, in Piaget's theory, plays a vital part in the development of the semiotic or symbolic function. This interaction, therefore, can be seen as contributing both to the social and the cognitive structures developing between mother and infant and intrinsic to the infant. The imitation occurring in this sequence would be termed imitation by contagion or echopraxis by Piaget & Inhelder (1969). Piaget argues that the infant is assimilating what he sees (the mother's lip smacking, element 9) to her own action scheme. This serves to trigger off the scheme. This is the earliest form of imitation.

No.	M/I	AGE 00:09:00 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	M	Picks Julie out of the bath. "There". Places her on the table, looks at her then away as she stretches over to get a towel and says "Drip dry, drip dry".	M_{nn} M_{nn}	II_{18} I_{26}	Ws//	

No.	M/I	AGE 00:09:00 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
2	I	Makes a grizzling noise, face puckers - looking at mother.	M_n	P	Vs	
3	M	Immediately turns back to Julie, puts her face directly in front of Julie's and says: "Uh-Uh-Uh"	M_{nn}	II_{14}	Vs	✓
4	I	Stops grizzling, looking directly at mother.		P	$V//_s$	✓
5	M	"No you don't, no you don't". "There, there" - looks away and begins to rub dry Julie's hair.	M_{nn}	I_{14}	$W_{s//}$	✓
6	I	Looking at mother, makes a grizzling noise.	M_n	P	Vs	
7	M	Alternates gaze from task of drying infant to infant's face. "You gotta keep clean, you gotta keep clean. Clean your ears too"	M_{nn}	I_{26}	$Ws//_s$	✓
8	I	Face puckers, draws in breath, looking at mother.		P	s	
9	M	"Uh-puh-puh" "No you don't, no you don't" - stops drying Julie, leans over and looks directly at her face. "You're going to a big birthday today".	M_{nn} M_{nn}	I_{19} I_{14} I_{26}	V s Ws W s	✓
10	I	Looking at mother's face, makes a soft vocalization.		P	Vs	✓
11	M	Smiles broadly. "Yes you are, yes you are". Still looking attentively at Julie. Bends over Julie with the towel around each hand as if to dry her trunk. "Come on, chat to me.	M_{nn} M_{nn}	I_{17} I_{11}	W+s Ws	✓

No.	M/I	AGE 00:09:00 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
		Hello, how's it? Hello, how's it?"	M_{nn}	I_{25}		
12	I	Looking directly at mother, vocalizes.		P	Vs	✓
13	M	"What's news?" - looking at Julie.	M_{nn}	I_{25}	Ws	✓
14	I	Vocalizes, looking at mother.		P	Vs	✓
15	M	Imitates vocalization, shakes her head, leaning over Julie and smiling - moves away slightly.		P23	V+s	✓
16	I	Starts to cry - still looking at mother.	M_{n}	P	Vcs	
17	M	Immediately leans over Julie as previously, looking directly at her. "Uh-puh-puh. No you don't. No you don't. No crying."	M_{nn}	I_{14}	Ws	✓
18	I	Stops crying - looking at mother.		P	Vc//s	✓
19	M	Starts to dry Julie's legs - looking at them as she dries.				
20	I	Vocalizes, looking at mother.		P	Vs	✓
21	M	Looks up at her, stops drying. "And what else, what else?"	M_{nn}	I_{17}	Ws	✓
22	I	Vocalizes again.		P	Vs	✓
23	M	Looking at Julie. "What else is news?" - smiling, nods her head slightly.	M_{nn}	I_{17}	Ws	✓
24	I	Looking at mother makes mouthing movements.		P	s	✓
25	M	"There's a nice clean girl". Taps Julie on the cheek with her index finger.	M_{nn}	I_{26}	Ws	✓

No.	M/I	AGE 00:09:00 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
26	I	Vocalizes - looking at mother.		P	Vs	✓
27	M	"Is that so?", looking at Julie.	M_{nn}	I_{17}	Ws	✓
28	I	Vocalizes - looking at mother.		P	Vs	✓
29	M	"Is that so". Looks away and picks up powder tin and begins to powder Julie.	M_{nn}	I_{17}	Ws//	✓
30	I	Maintains gaze at mother's face.		P	s	✓
31	M	Picks Julie up and holds her over her shoulder.				

In this sequence an exchange of vocalizations achieving an almost conversational pattern was evident. Three of the infant's ten vocalizations were cries or sounds preliminary to crying (elements 2, 6, 16). It is significant that these ceased when the mother was talking to her. The mother used the negative "Uh-puh-puh" with emphasis and combined it with head shaking and direct gaze to control the infant's crying (elements 3, 9, 17) - this vocalization only followed Julie's crying. Julie's other vocalizations (elements 10, 12, 14, 20, 22, 26, 28) were responded to with smiles, imitations and verbalizations (elements 11, 13, 21, 23, 25, 27, 29). The patterning of the exchange was as follows:

(A = infant vocalization, B = maternal vocalization,
Ac = infant cry.)

Ac - B - B - Ac - B - B
A - B - A - B - A - B
Ac - B - B
A - B - B - A - B - A - B

Julie's visual attention on the mother's face was maintained throughout this sequence. The mother alternated her attention from her tasks

(drying, powdering) to Julie's face (elements 1, 5, 7, 9, 29). The controlling vocalizations (uh-puh-puh, No you don't, etc.) were made when the mother was focussing her attention on Julie; her other activities were suspended.

The mother's withdrawal (element 15) was immediately met with a cry from the infant (element 16) which brought the mother back to the position she had been in (element 17). This type of interaction is likely to contribute to the infant's awareness that sounds make people act and very often achieve a desirable goal. The fact that Julie's crying ceased immediately the mother's attention was again directed at her (element 18) tempts one to infer intention in the cry, i.e. the appearance of meaning$_{nn}$: there are however no behavioural criteria yet evident which warrant this inference. This is an example of reciprocal behaviour.

In the structure of this interaction there was evidence of both vocal and visual stimuli contributing to the maintenance of the phatic channel. This is, of course, a feature of adult interaction. The infant was not yet alternating attention or using the vocal channel to 'maintain contact' when visual contact was broken: however, the reciprocal nature of the vocal exchanges can be seen as a step towards achieving this social skill. Visual attention was still the predominant feature of the social exchanges. All the interactions discussed so far were structures around situations in which the mother was acting on the infant, as yet there had been no evidence of joint action on the world.

No.	M/I	AGE 00:11:00 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	I	Lying on table, eyes wide open, looking at the mother.		P		
2	M	Opens her mouth, gaze fixed on Julie, holding Julie's feet.				

No.	M/I	AGE 00:11:00 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
		She slowly moves down over Julie, maintaining eye contact until she kisses her noisily on the neck.		P	$s_{//}$	✓
3	I	Turns her head slightly towards her mother, mouth open, eyes wide.		P23	s	✓
4	M	Withdraws, gaze directed at Julie, opens her mouth widely.		P23	s	✓
5	I	Mouth opens wider, eye contact maintained.		P23	s	✓
6	M	Begins to smile, moves slowly down over Julie maintaining eye contact, again kisses her noisily in the neck.		P	+s	✓
7	I	Chuckles during and after the kiss. Smiles broadly as	M_n	P	V+s	✓
8	M	Withdraws quickly, gaze on Julie's face, opens her mouth wide, inhales, and begins to move down over Julie. She makes a vocalization with a falling then rising note as she kisses Julie in the neck.			$V_{s//}$	✓
9	I	Smiling, intent gaze on mother.		P	+s	
10	M	Withdraws, takes hold of Julie's feet and moves them rhythmically (an element of the Kicking Game). "Is that so funny, is that so funny? Hey?" Lets go feet.	M_{nn}	I_{17}	W+s	
11	I	Watching mother. Vocalizes.		P	Vs	
12	M	Nods her head vigorously. "Yes" Takes hold of Julie's feet again. "Good"	M_{nn} M_{nn}	II_{20} II_{20}	Ws	

This sequence of interaction is considerably more complex than the previous examples. Again eye contact seems to be the index of shared attention. Except for the kissing episodes (elements 2, 6, 8), it is maintained throughout this exchange.

As in the previous episode there is evidence of alternation of roles. The mother's "Is that so funny" (element 10) was contingent on Julie's chuckle and smile and was not an aspect of the mother's actions in the same way that "Kick, kick" is while she is moving Julie's feet as in previous episodes. In element 12 the mother combined a conventional gesture with the appropriate verbalization. This type of exchange has important implications for the development of signification and representation. There was a consistent ordering of the elements of the mother's behaviour:

(1) Gaze at
(2) Open mouth
(3) Move slowly down over the infant
(4) Kiss neck
(5) Withdraw.

This formed a unit or round which was repeated. Because of this consistency each event could become a signification of the total round or of the next element. If this occurred one could infer that the infant, in some sense, knew what to expect and must therefore have a memory, even if transitory, of the total event. One can infer from the infant's behaviour - maintained eye gaze, smile, etc. during the mother's actions - that she was still 'in' the game.

The gradual introduction of new elements is interesting. Element 7 - a chuckle, element 8 - the vocalization accompanying the kiss, element 10 - a verbalization in response to Julie's laugh, element 11 - Julie vocalized. In Piagetian terms the schemes[1], once developed, were being elaborated through the process of accommodation.

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[1] The reference here is not just to cognitive schemes but also to the social schemes developing between them.

The episode at 00:14:01 commenced with the mother attempting to break into a period of obligatory attention which Julie was displaying towards the observer. Various techniques were employed by the mother. These are listed in order of execution.

1. Talking to the infant, e.g. "Who do you see there?"
2. Calling the infant by name.
3. Nuzzling into the infant's neck.
4. Moving the infant and attempting to insert herself between the object of obligatory attention and the infant.
5. Turning 180° so that the observer was out of the infant's line of vision.

This final maneouvre was successful and the mother immediately attempted to redirect the infant's attention onto herself (element 1).

No.	M/I	AGE 00:14:01 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	M	Looking at Julie, smiling, shakes her head while talking. "Hello. Did you have a lovely lunch?" The tone is high-pitched.	M_{nn}	I_{24}		✓
2	I	Looking intently at mother.			s	✓
3	M	"Did you?" "Hello Baba" "Did you have a lovely lunch?" Again a high-pitched tone, direc direct gaze, smile and head shaking.	M_{nn} M_{nn} M_{nn}	I_{24} I_{28} I_{24}	W+ Ws+ Ws+	✓
4	I	Maintains eye contact, both arms moving in a rhythmical pumping fashion. Mouthing movements obvious.		P	s	✓

No.	M/I	AGE 00:14:01 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
5	M	Maintains eye contact. Nods head and imitates the mouthing twice.		P23	s	✓
6	I	Eye contact maintained. Burps.	M_n	P	s	✓
7	M	Smiles, still looking directly at infant. "Was that hard work? Was that hard work?" Shakes her head while talking, leans forward to kiss Julie's neck.	M_{nn}	I_{17}	W+s	✓
8	I	Immediately fixates again on the observer.			go	
9	M	Moves across room and lies Julie down.				
10	I	Extends her neck and appears to be looking at the curtains hanging behind her.				
11	M	Glances in the direction of Julie's gaze. "What are you looking at? What are you looking at?" Begins to undress Julie.	M_{nn}	$I_{17,24}$	Wgf	✓

Redirection of the infant's attention once this obligatory attention on an object was present was difficult to achieve. In this sequence, once the mother managed to redirect the infant's attention onto herself a fairly long and complex interaction took place. In the earlier episode at 00:04:00 this ability to switch attention was not evident: the progression may be seen as development towards alternation of

attention between object and mother[1]. This alternating attention is the criterion for stage IV of the developmental sequence being postulated. It would seem that this episode reflects an intermediate stage in the loosening of attention and the establishment of biphasic attention

It would seem that the developmental sequence could be described as:

1. Stage of diversive attention.
2. Stage of obligatory attention.
3. Stage of attention directed to objects/persons selected by the mother.
4. Stage of biphasic attention (Bruner 1969) which is characterized by alternating attention patterns.

The relevance of these attention patterns to the development of communicative competence is of fundamental importance. The transition through these stages coincides with the first four stages of the developmental sequence being postulated. This sequence is similar to the one postulated by Bruner (1969) except for the introduction of stage 3.

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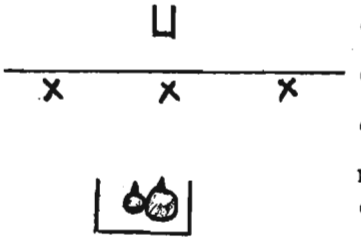
[1] This inference is made on very little evidence and further investigation of this obviously important phenomenon is necessary. The experimental situation used by Schaffer in the film "Early Interactions", 1976, would seem to be the best way to investigate this. Infants studied longitudinally in this situation would provide one with information of the development of the ability to switch attention between two or more objects and between objects and mother. The appearance of the latter will indicate the presence of intersubjectivity and the transition into stage IV of the developmental sequence described earlier. Schaffer's situation is represented below:



The mother's opening remark "Hello" (element 1) aptly marks the opening of the phatic channel and her awareness that she was not included into the infant's obligatory attention pattern i.e. the infant was not communicating or sharing the experience/object with her.

The remarks made by the mother (elements 1, 3) do not refer to the preceding object of the infant's attention but to a previously shared experience. The mother used various techniques to maintain Julie's attention, e.g.

1. High pitched verbalizations (elements 1, 3)
2. Eye contact, movements of her head, smiles (elements 1, 3, 5, 7).

In element 11 the mother followed the direction of Julie's gaze but did not comment on the object which Julie was looking at, she commented on Julie's action of looking. "What are you looking at?" Julie's burp (element 6) did not pass unnoticed by the mother, the verbal comment "Was that hard work?" referred, as in element 11, to the action.

This reference to the infant's actions is interesting in view of the importance placed on action by Piaget and also because objects have not yet entered, to any great extent, this dyad's social structures. Their interactions consist mainly of joint attention on each other, action and verbal games and actions carried out on the infant by the mother.

Julie (element 4) displayed rhythmical arm and mouth movements while the mother was talking to her. These, it has been suggested by, amongst others, Brazelton et al (1974) are features of the infant's reaction to social stimuli. It can be assumed that these contribute, with the eye contact, to the mother's awareness of the infant's attention on her. The introduction of other indices of social attention are important because they reduce the total reliance on eye contact - this must take place for the more advanced

interactional skills of stage IV to appear[1].

The importance of gaze direction was again very evident in this episode. The mother initially worked at getting Julie's attention redirected from the observer to focus onto herself. When this occurred she immediately started to communicate with the infant. Eye contact was maintained until element 7 and, in element 11, which terminated this episode, the direction of the infant's gaze was remarked on by the mother.

No.	M/I	AGE 00:16:00 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	I	Lying on her back without a nappy, looking directly at the mother's face and smiling.		P	+s	
2	M	Looming over Julie, one hand on each side of Julie's body. She repeats "Uh Uh" twice.		P	Vs	✓
3	I	Smiles, and gurgles quietly. Maintains eye contact.		P	V+s	✓
4	M	Looking directly at Julie, opens her mouth in an "O" shape and takes a noisy, drawn-out inhalation. Moves away slightly from Julie.		P	Vs	✓
5	I	Vocalizes with a short "Aah". Eye contact maintained.		P	Vs	

[1] It is doubtful whether the arm and mouth movements would be sufficient to indicate social attention. However with occasional eye contact they may indicate sustained social attention. This is an empirical question which requires further investigation.

No.	M/I	AGE 00:16:00 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
6	M	Then lunges forward to about four inches from Julie's face, exhales with a loud "boo". Stands back slightly.	M_n	II_{19}	Vs	✓
7	I	Looking directly at the mother, mouth wide, hands clasped in the midline, chuckles.	M_n	P	Vs	✓
8	M	Inhales noisily again, opens her mouth. Eye contact maintained.		P	Vs	✓
9	I	Hands and arms pumping, looking directly at mother, blinks as		P	s	✓
10	M	Lunges forward, with the exhalation "boo", and there is a pause here between the completion of the inhalation and the exhalation.	M_n	II_{19}	Vs	✓
11	I	Momentarily still. Eye contact maintained (while the mother is inhaling).		P	s	✓
12	M	Repeats this sequence, inhaling noisily, standing away from the child as she does this.		P	Vs	✓
13	I	Eye contact. Hands and arms pumping.		P	s	✓
14	M	Exhaling sharply as she lunges forward over the child with the "boo". Eye contact maintained.	M_n	II_{19}	Vs	✓
15	I	Chuckles, looking at mother.	M_n	P	V+s	✓
16	M	Standing back, smiling - looking at Julie.		P	+s	
17	I	Looking at mother. Still.		P	s	

No.	M/I	AGE 00:16:00 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
18	M	Again breathes in with a noisy inhalation, smile on her face, watching Julie intently.		P	V+s	✓
19	I	Hands moving, vocalizes. Eye contact.		P	Vs	✓
20	M	Leans forward with a "boo". Eye contact.	M_n	II_{19}	Vs	✓
21	I	Eye contact, vocalizes.		P	Vs	✓
22	M	Breathes in again - watching Julie.		P	s	✓
23	I	Vocalizes, eye contact.		P	Vs	✓
24	M	Leans forward, exhales sharply, "boo". Eye contact maintained.	M_n	II_{19}	Vs	✓
25	I	Vocalizes, smiling, kicking against the mother's stomach, looking at mother.		P	V+s	✓
26	M	Inhales again noisily, eye contact maintained.		P	Vs	✓
27	I	Looking at her, smiles, hands moving, vocalizes.		P	V+s	✓
28	M	Leans forward, kisses Julie on the left side of her neck, going "bo-bo-bo-bo".	M_n	II_{19}	Vs//	✓
29	I	Starts kicking at the mother's stomach again, looking at the mother.		P	s	✓
30	M	Begins to inhale deeply, broad smile.		P	+s	✓
31	I	Vocalizes, looking at mother.		P	Vs	✓
32	M	Leans forward sharply, "boo".	M_n	II_{19}	Vs	✓
33	I	Chuckles, hands move, kicks against the stomach.	M_n	P	V+s	✓

No.	M/I	AGE 00:16:00 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
34	M	Breathes in again, leans forward, exhales sharply, "boo". Eye contact.	M_n	II_{19}	Vs	✓
35	I	Laughs. Eye contact.	M_n	P	V+s	✓
36	M	Laughs and says "Is that so funny?" moving her head from side to side, looking at infant. She breathes in again.	M_{nn}	I_{17}	Ws	✓
37	I	Vocalizes, hands moving, eye contact.		P	Vs	✓
38	M	Holds her breath, leans forward looking at Julie and says a very sharp "boo", sharper than any of the previous occasions. Breathes in again.	M_n	II_{19}	Vs	✓
39	I	Watching her intently.		P	s	✓
40	M	Holds her breath. Kisses Julie on the left side of her neck.		P	s//	✓
41	I	Smiles, opens her mouth, eye contact.		P	+s	✓
42	M	Stands back. Breathes in again looking at Julie.		P	s	✓
43	I	Mouth opens wide, eye contact.		P	s	✓
44	M	Mouth open, eye contact. Pauses in the sequence.		P	s	✓
45	I	Vocalizes, feet kicking against the mother's stomach, hands moving, looking at mother.		P	Vs	✓
46	M	Nodding her head, says "Kick. Come on, kick". Stands back, puts her hair out of her face.	M_{nn}	I_{17}	W_s	✓

No.	M/I	AGE 00:16:00 STAGE II Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
		Takes hold of Julie's legs, one in each hand, puts them against her stomach and then leans forward over her, resting on her arms, and says "Right". Looking at Julie.	M_{nn}	II_{10}	W_s	✓
47	I	Kicks sharply, hands moving, looking intently at the mother.		P	s	✓
48	M	Laughs, breathes in, begins to bend forward, and tickles Julie's tummy, with her hands moving up towards Julie's face, going "Tickle, tickle, tickle". She repeats this twice.	M_{nn}	II_{18}	V+s	✓
49	I	Smiling, hands moving, looking at mother.		P	+s	✓
50	M	Then stands back, looking at infant.		P	s	✓
51	I	Looking at mother intently.		P	s	✓
52	M	Breathes in, watching Julie.		P	s	✓
53	I	Vocalizes, eye contact.		P	Vs	✓
54	M	Holds her breath, moving down over Julie. Eye contact.		P	s	✓
55	I	Watching intently.		P	s	✓
56	M	Says "boo" slowly, and then leans forward and kisses her on the left side of her neck. Stands back looking at Julie, smiling, and says "Mama".	M_n M_{nn}	II_{19} II_{18}	V+s W+s	✓

This episode is a good example of the verbal and action games which form an important part of this dyad's interaction. Their relevance to

the development of representation has already been referred to. This type of interaction would also contribute to the establishment of turn taking and maintained attention which are fundamental to communication. The majority of these actions were accompanied by some sort of vocalization (34 out of 56) and of these, many were in a reciprocal sequence (elements 2-9, 18-21, 23-28, 31-38, 45-47). Only four occurred in isolation (elements 10, 48, 52, 56). Three of these were made by the mother. Reciprocal vocalizations were beginning to play an increasingly important part in their interactions. These, with other features referred to earlier, mouth movements, certain postures and limb movements, all contribute to the maintenance of the phatic channel and thus reduce the total reliance on eye contact. Communication between mature members of a social group can be maintained entirely by the auditory/vocal channel[1] e.g. a telephone conversation.

Eye contact remains the feature around which mother-infant interaction is organized until speech is present in the child, at which stage, depending on the circumstances of the interaction, these two behaviours combine in the establishment and maintenance of the phatic channel. In this episode, except where the mother was kissing Julie (elements 28, 40, 56) eye contact was maintained between them. The structure of the game was established at the beginning of the interaction. It comprised:

1. Eye contact.
2. Mother inhaling noisily, withdrawing slightly from Julie.
3. Mother lunging forward with a noisy exhalation "Boo".

There was a pause between 2 and 3 which was occupied by some action of Julie's e.g. vocalization (elements 5, 19, 23, 27, 31, 45, 53), pumping movements of arms and/or feet (elements 13, 19, 27, 45), smiling (element 27), laughing (element 35). There was, after most of the third elements, some response from Julie e.g. laughing (element 7, 15, 33, 35), vocalizing (elements 19, 21, 25), pumping of hands and/or legs (elements 25, 29, 33).

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[1] Abstract content can be introduced into the auditory/vocal channel. Using only eye contact, very limited content can be communicated. General states e.g. I am attending, threat, provocation, can be communicated; no propositional content is usual.

During this episode there were ten rounds of the 'Boo game', of these eight involved four elements - mother withdraws, infant reacts, mother lunges forward with a 'boo', infant reacts.

Julie's sustained attention evident by reactions during and after each round can be seen as evidence of the presence of signification. Her reactions to the 'boo' element can perhaps be seen as the signal for the mother to continue with another round. It is impossible at this stage to infer that Julie intends the mother to repeat the action - however, this does not detract significantly from the interaction because the mother, while she has the infant's attention, does continue.

The variations introduced by the mother - verbalizations (elements 36, 46, 48), kissing Julie's neck (elements 40, 56), tickling Julie (element 48), are interesting. It is difficult to know why the established routine is broken at these points. These variations would however contribute to the increasing complexity of the social structures by being accommodated to and assimilated to the schemes within these structures. The novelty is also likely to maintain the infant's interest in the sequence.

Julie's kicking behaviour (elements 25, 29, 33, 43, 47) may reflect only a general excitement, however the mother acts upon this to incorporate the kicking game into this new verbal and action game (element 46).

In element 35 Julie laughed for the first time in this sequence. This could be seen as the behaviour which, to the mother, indicated the successful completion of the game: however, it is unlikely that this was the recognized end point at the commencement of the game. It seems more likely that the variations which were introduced to maintain interest were a reflection of both the mother's state and cues which she was picking up from the infant. This was the longest unchanging sequence of interaction recorded in this pair: the number of rounds which an adult will repeat without losing interest will vary between dyads and with the type of interaction which is being repeated.

Personal experience indicates that adults tire of repetition long before children and infants do. According to Piaget's stages during the sensorimotor period, Julie is now in the stage of *secondary circular reactions*, which he defines thus:

> "... in the circular reactions which we call 'secondary' ... the movements are centred on a result produced in the external environment and the sole aim of the action is to maintain this result; furthermore it is more complex, the means beginning to be differentiated from the end ..." (Piaget 1953, page 157)

The separation of means from ends in Piaget's outline are all in relation to interaction with the natural world - this distinction is more difficult to make when one considers social interaction where responses to actions are themselves actions and do not bear the same relationship to the actor as the effect on the natural world caused by the action of an actor.

This interaction, because it involved very little physical contact (in this way it differed from the kicking game) relied almost entirely on nonphysical social exchanges for its continuation, and can be seen therefore as an advance, in terms of the requirements for adult interaction, over the games involving vocalizations *and* physical stimulation.

The following episode (00:18:05) was the first at which Julie was filmed in the playroom at the University. The emphasis on object presentation (11 presentations) may be an artefact of the strangeness of the environment to both the mother and infant. However, even if this was so, Julie's reactions to these presentations must be regarded as actions which are included in her behavioural repertoire. The social structures existing between them must accommodate to the novel environment (including the range of toys) and to any new social actions which this will elicit. Julie's prehension was still unformed and frequently unsuccessful. The mother's complementary (scaffolding) behaviour was very obvious. Both of these features are evident in the following short extract which marks the beginning of stage III.

12.1.1.3 Stage III

No.	M/I	AGE 00:18:05 STAGE III Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	M	Mother sitting on a chair holding Julie on her knee. Presents a large rubber dog to Julie, shaking it in front of Julie's face. Alternates gaze between object and Julie.	M_n	III_3	$s//_{gp}$	✓
2	I	Focusses on it and reaches towards it with her left hand, misses. Makes two unsuccessful grasping attempts, using both hands.	M_n	III_4	gs	✓
3	M	"Oh, it's too big", bends down to put the dog on the floor.	M_{nn}	I_7	wg	✓
4	I	Leans forward to look at the dog.		P	gf	✓
5	M	Picks up block, holds it in front of Julie, shaking it. "Here. Here". Thrusts it towards Julie's left hand. (Then removes it briefly from Julie's line of vision as she adjusts Julie's position.) Re-presents it.	M_{nn}	II_3	$wg//_s$	✓
6	I	Focusses on it immediately and reaches towards it with her left hand - once the reach has been initiated, her eyes close[1] and she turns her head away slightly - she misses the object, opens	M_n	III_4	g//	✓

[1] Bruner (1974) refers to "cutting down degrees of freedom" when this occurs.

No.	M/I	AGE 00:18:05 STAGE III Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
		her eyes, and reaches with both hands (what Bruner (1974) has referred to as a 'pouncing' movement).				
7	M	Monitoring these attempts visually. *Places* the block in Julie's left hand and supports it there.	M_n	$III_{3,16}$	$s//g//s$	
8	I	Fingers close over the block - visually fixating it.	M_n	III_4	g	
9	M	Removes block, puts it on the floor, leans forward over the infant talking quietly to her.		P	$W_{g//s}$	

It is obvious that the mother intended Julie to take the objects she presented. However, although Julie's actions reciprocated the mother's, it was not possible to infer at this stage that Julie was aware of the mother's intention. This would imply the presence of an intersubjectivity for which there was no behavioural evidence yet present.

Other interactions during this episode gave evidence of an increasing skill and complexity in their interactions but there were no new behaviours which marked a change in the quality of their interactions. During this ten minute session eleven presentations of five objects were made, one object, a ring, being presented six times, a doll twice and a rubber dog, duck and block once each. On four occasions Julie was successful in capturing the object.

At 22 weeks three new and interesting variations into the interactions between mother and infant were evident. These were:

1. The mother demonstrated the relationship between objects, for example demonstrating how a ring fits on and can be taken off a peg. To assimilate this required that Julie alternate her attention between the one object and the other and then relate these two objects into one cognitive scheme. In this demonstration the mother encouraged Julie to attempt an action based on this relationship i.e. to place a ring onto the peg.

2. The mother introduced a second object when the infant was already acting on and attending to another object: this too encouraged an alternation of attention between two objects.

3. The mother incorporated an object into a verbal game not unlike the games played at an earlier age when the mother herself or an action of the infant's (kicking) were the features around which the game was structured.

Examples from the data for these three innovations follow:

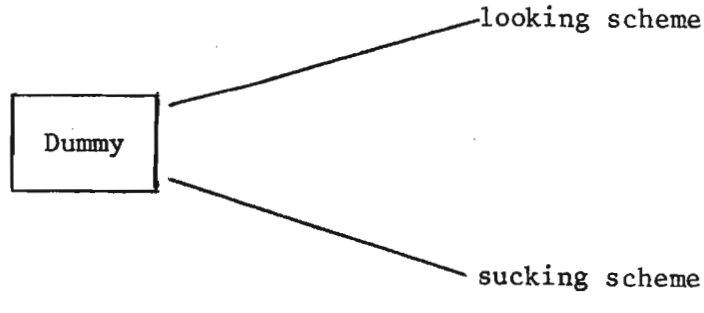
(1) Mother picks up the ring toy in her right hand, holds it in front of Julie and removes four rings with her left hand. She then, with an exaggerated movement and very slowly replaces the rings onto the peg. Julie watched this demonstration intently.

(2) Julie is holding a ring and looking at the peg: mother picks up a squeaky rubber toy, holds it in front of Julie and squeezes it causing it to squeak. Julie's attention is diverted to the rubber toy. Mother then leans forward in front of Julie going "Boo Boo Boo" as she squeaks the toy.

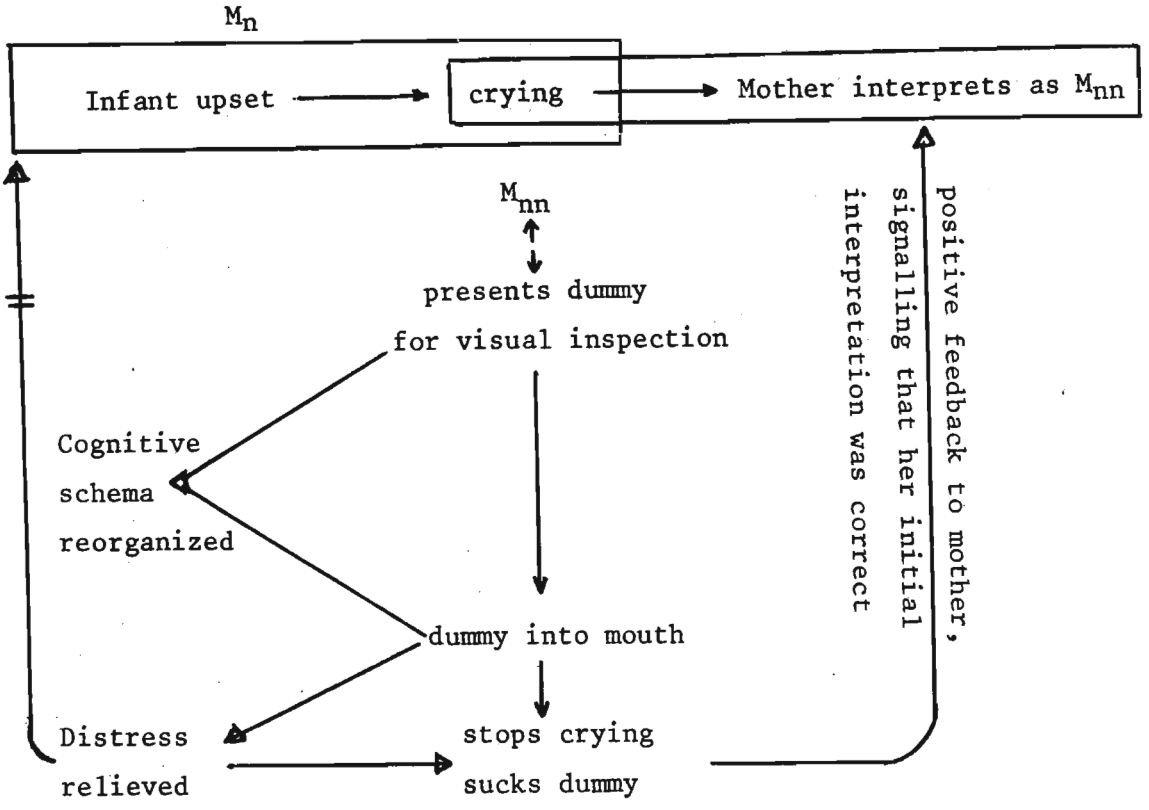
(3) Mother presents a rag doll to Julie - Julie, looking at it, reaches for it with her right hand. Mother withdraws the doll and begins a game with it, banging the doll onto Julie's forehead as she says "Boo". Julie grabs the doll, looks at it intently and then looks towards the mother, then back at the doll.

These behaviours represent a considerable advance over those displayed four weeks earlier. Alternating gaze patterns were present, between two inanimate objects and very infrequently between mother and object. This is regarded as a transition into the fourth stage of the developmental sequence.

The session when Julie was 00:24:02 showed no qualitative changes in Julie's behaviour or in the interactions between the mother and Julie. Again there were frequent games which combined objects and repeated actions involving these objects, for example tapping Julie on the chin with a rag doll. These repetitive interactions combined the feature referred to previously of delays between elements in the sequence which, it has been suggested, contribute to the eventual achievement of representation and facilitate the acquisition of alternating gaze patterns and intersubjectivity. One of the objects presented to Julie for visual inspection in this episode was her dummy. This was the first occasion that the mother presented an object of this nature (dummy, bottle) for visual inspection before inserting it into the infant's mouth. This would facilitate reciprocal assimilation between two schemes, those of looking and sucking, and the generalizing assimilation of one object into these two schemes.



If the analysis is extended to include contingent individual and partner events the following occurs:

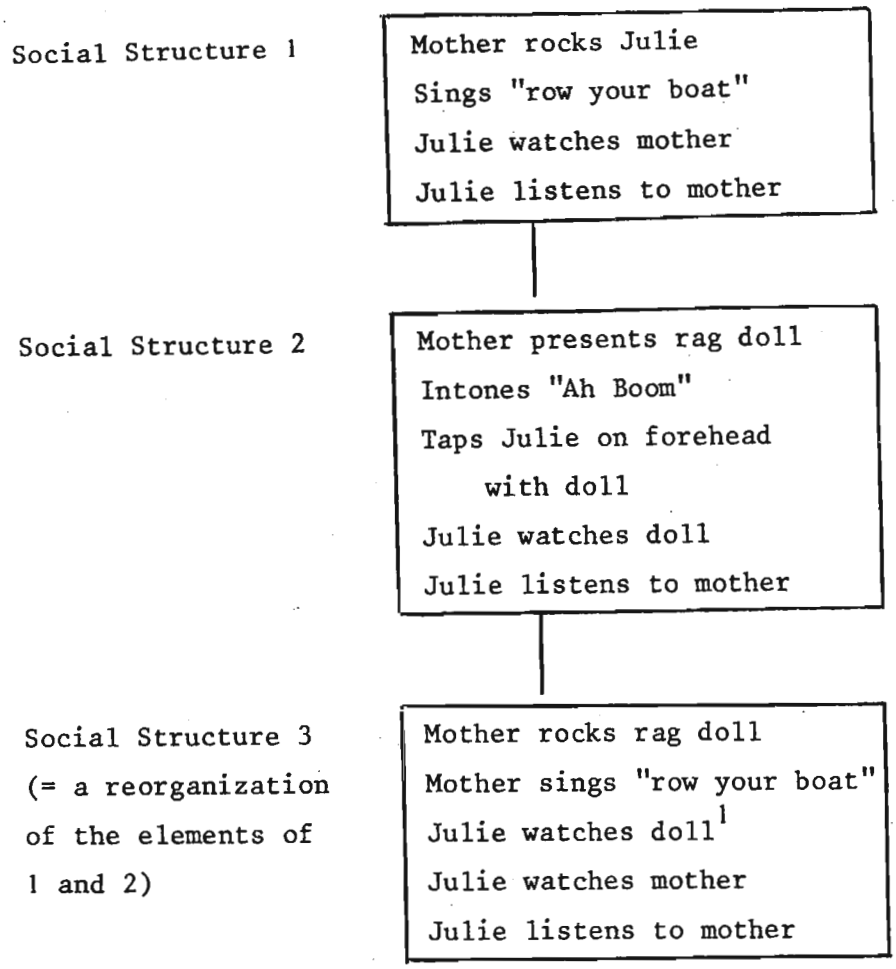


Changes in both the individual and social structures have taken place.

With Julie at 00:26:04 the advances in interaction were again quantitative rather than qualitative. Extensions of behaviour introduced by the mother can be seen as facilitating the elaboration of both Julie's cognitive structures and their social structures. An example follows.

During the episode, the mother established a verbal game routine of "Row, row, row your boat gently down the stream", singing this and rocking Julie from side to side as she sang. She also established a verbal game which incorporated the rag doll, a game of presentation and withdrawal punctuated with "Ah Booms".

She then combined the two to incorporate the rag doll into the "Row your boat" routine, rocking the doll in a similar fashion to which Julie was rocked. This can be presented thus:



Another interesting introduction into this episode was the mother's emphasis on parts of a whole - this would be relevant in the acquisition of predication. For example, mother presented the rag doll to Julie, held it in front of her and said: "See. She's got a smart little apron on", as she holds out the apron. This was followed by "There are her eyes", pointing at the doll's eyes, and "There are her shoes", pointing at the shoes. These changes suggest that their interactions were in a transition phase.

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[1] An interesting extension of this reciprocal assimilation and accommodation would be Julie recognizing the similarity of the situation in which the doll has replaced her, that is a generalizing assimilation of objects, self and doll fitting into one action scheme.

Julie watched the demonstration and then leaned forward to mouth the doll. The mother responded with "No man", and sat Julie up.

In this next episode the mother managed to maintain Julie's attention on pictures in a magazine, although only for a short time. Julie was more inclined to treat the book as an object to be played with rather than looked at (element 16). The mother's verbalizations which related to pictures in the book were more complex than previously, for example: "See, it's bikini time"; "Another pretty lady"; "Look at that dog. Woof-woof-woof"; etc. (elements 3, 5, 7, 9, 13). The mother used various techniques to maintain or direct Julie's attention to the book, for example exaggerated page turning (element 5), tapping on the book (element 9).

No.	$M/_I$	AGE 00:29:01 STAGE III Description	$mn/_{mnn}$	P,I,II III	Coded Beh.	Approp.
1	M	Picks up a book, places it, with an exaggerated gesture, on the arm of the chair in which she is sitting. Julie is on her knee. "Look, look, look, look." Glances from book to Julie to book.	M_{nn}	II_8	$Wg//_s//_g$	✓
2	I	Turns around and looks at book		P	g	✓
3	M	Opens book, points at picture. "See, it's bikini time." Looks from book to Julie to book.	M_{nn}	$I_{7,8}$	$Wg//_s//_g$	✓
4	I	Looks away from book.				
5	M	Noisily turns a page to attract Julie's attention. "Look, look, look." "There's a pretty lady" - pointing to picture. Alternating gaze between Julie and the book.	M_{nn} M_{nn}	$II_{8,19}$ $I_{7,8}$	$Wg//_s//_g$	✓

No.	M/I	AGE 00:29:01 STAGE III Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
6	I	Looks back at book.		P	g	✓
7	M	Turns page. "Another pretty lady" - alternating gaze from book to Julie.	M_{nn}	I_7	$Wg//s//g$	✓
8	I	Turns away and looks over her right shoulder.				✓
9	M	Makes exaggerated tapping movements at the page. "Look at that dog." Alternates gaze.	M_{nn}	$I_{6,8}$	$Wg//s//g$	✓
10	I	Turns back to book.		P	g	✓
11	M	"Woof woof woof" - nodding her head, looming in towards Julie as she says this. Turns the page. "What's that lady doing? Is she making some tea?"	M_n M_{nn}	II_7 I_7	$Wg//s//g$	✓
12	I	Watching intently, stretches out her left hand and places it on top of the open book. Lifts hand.		P	g	✓
13	M	Turns page. "There's another pretty lady." Alternating gaze.	M_{nn}	I_7	$Wg//s//g$	✓
14	I	Stretches out hand and again places it on the book.		P	g	✓
15	M	Looks at Julie, picks up the book. Taps her on the nose with it. "Woo." Returns the book to the chair arm. Leans over in fron of Julie. "Mm?" Turns and points at a picture.	 M_{nn}	P III_8	 $V^{s//g//s//g}$	✓
16	I	Grabs hold of a page of the book and waves her arm,		P	g	✓

From element 16 the sequence changed from that of looking at the book to one of playing with the book.

Looking at books contributes to the separation of part from whole (picture from book) which is important in the evolving attention and cognitive patterns of the infant. It is obvious that Julie's behaviour was becoming increasingly organized and skilled. The alternation of actions with the mother was achieved with apparent ease and their behaviour was taking on an increasingly 'conversational' pattern.

Also present in this ten minute episode were various verbal games, a new one, "clap handies", was introduced. This game was similar to the kicking game in that actions of the child were incorporated into the verbal sequence intoned by the mother.

Unfortunately this was the last occasion on which this dyad was videorecorded.

The following five histograms (Figures 16, 17, 18, 19, 20) present quantifications of some of the behaviours which occurred in the development of this dyad's social structures. The amount of time the mother spent looking at her infant is presented in Figure 16. The time spent by the infant looking at the mother is presented in Figure 17. The decrease at 18 weeks coincided with the introduction of objects into their action sequence: at 22 weeks the objects were being included into verbal game sequences which accounts for the increase during this episode.

The number of glances from mother to infant and infant to mother per unit of time is presented in Figure 18.

The amount of time spent in mutual gaze (Figure 19) reflects the progression through the three developmental stages postulated, the highest incidence occurring in stage II from 00:02:00 to 00:18:00. Finally, Figure 20 shows the percentage of time in each episode in which the infant looked at objects presented by the mother (stage III behaviour from 00:18:00 to 00:30:00).

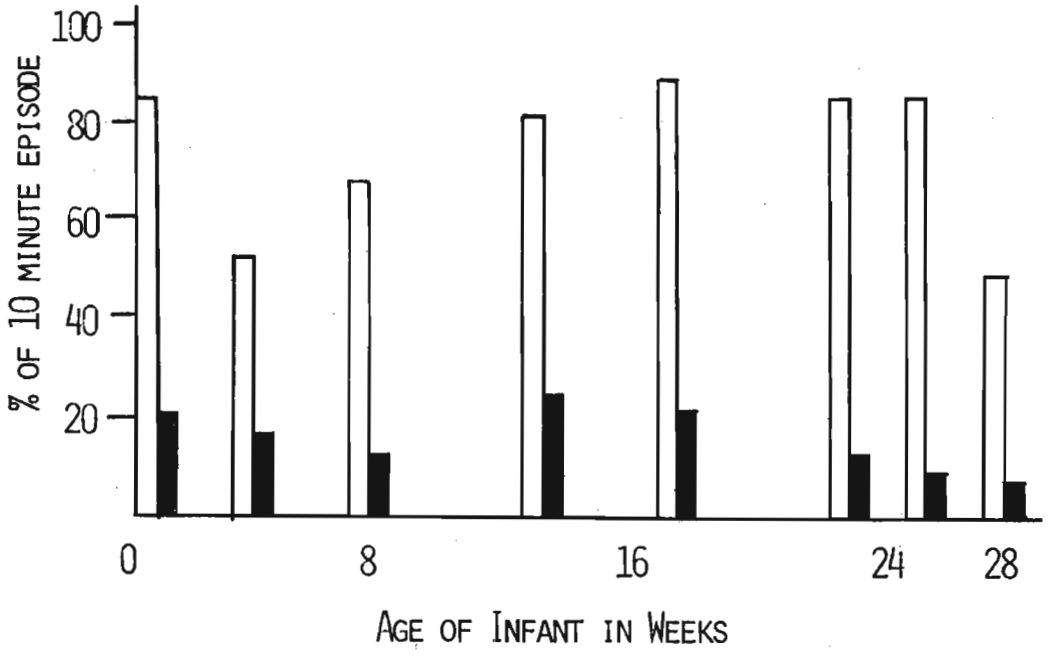

Figure 16 Percentage of Time in Each Ten Minute Episode
Mother Looks at Infant □
Mean Duration of Gazes in Seconds ■

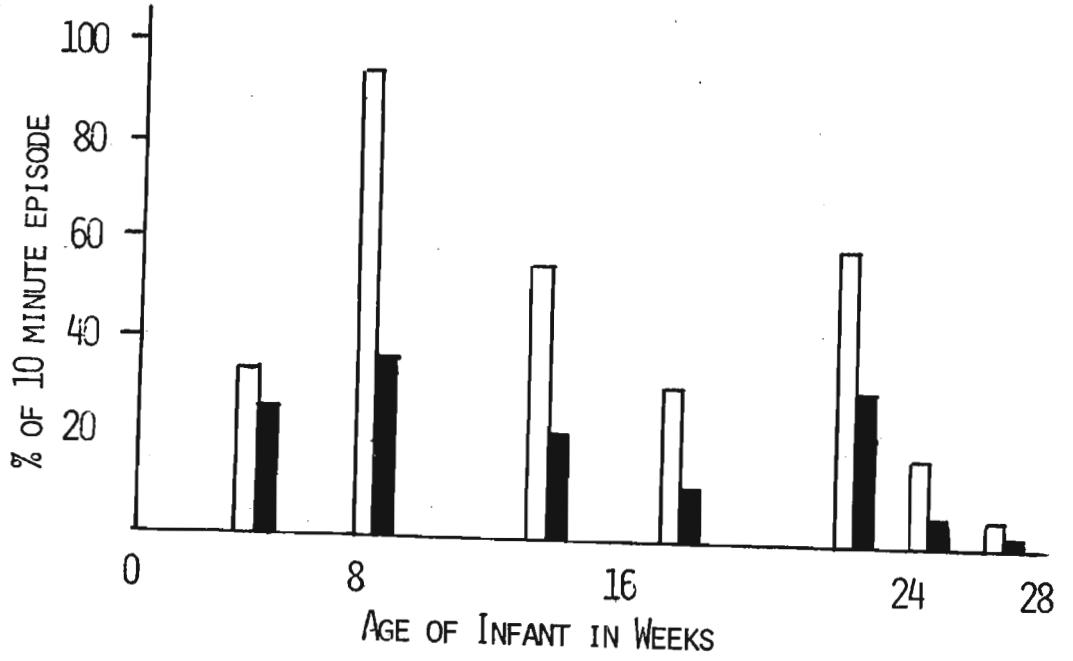

Figure 17 Percentage of Time in Each Ten Minute Episode
Infant Looks at Mother □
Mean Duration of Gazes in Seconds ■

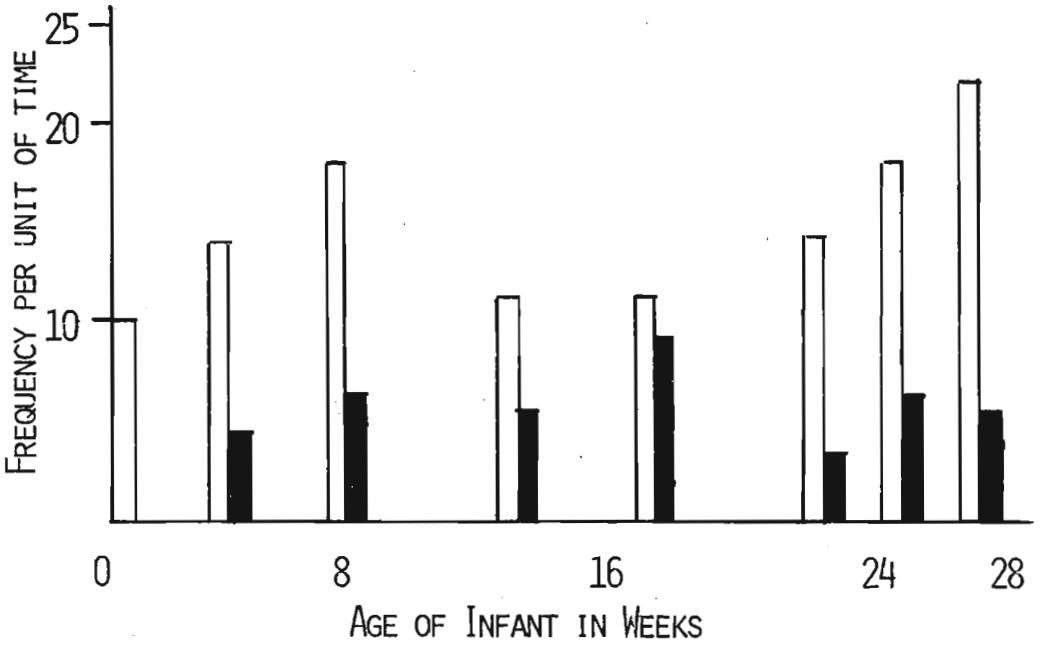

Figure 18 Frequency of Glances Per Unit of Time:

Mother to Julie □

Julie to Mother ■

$(\frac{f}{\text{time}} \times \frac{100}{1})$

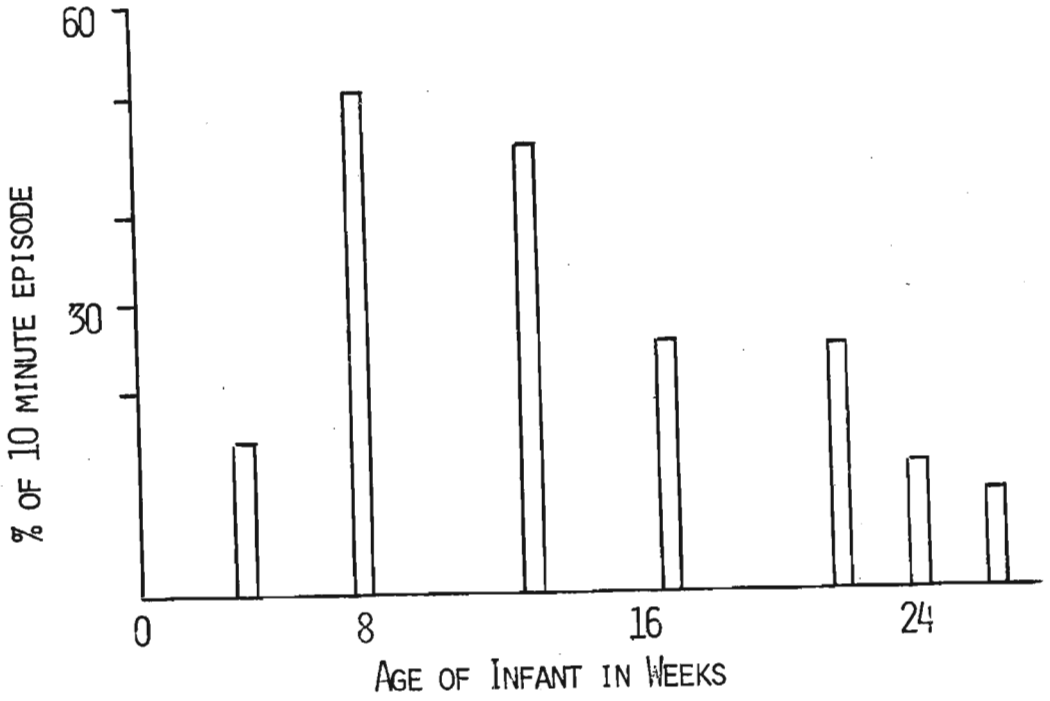

Figure 19 Percentage of Time in each Ten Minute Episode Mother and Infant were Involved in Mutual Gaze.

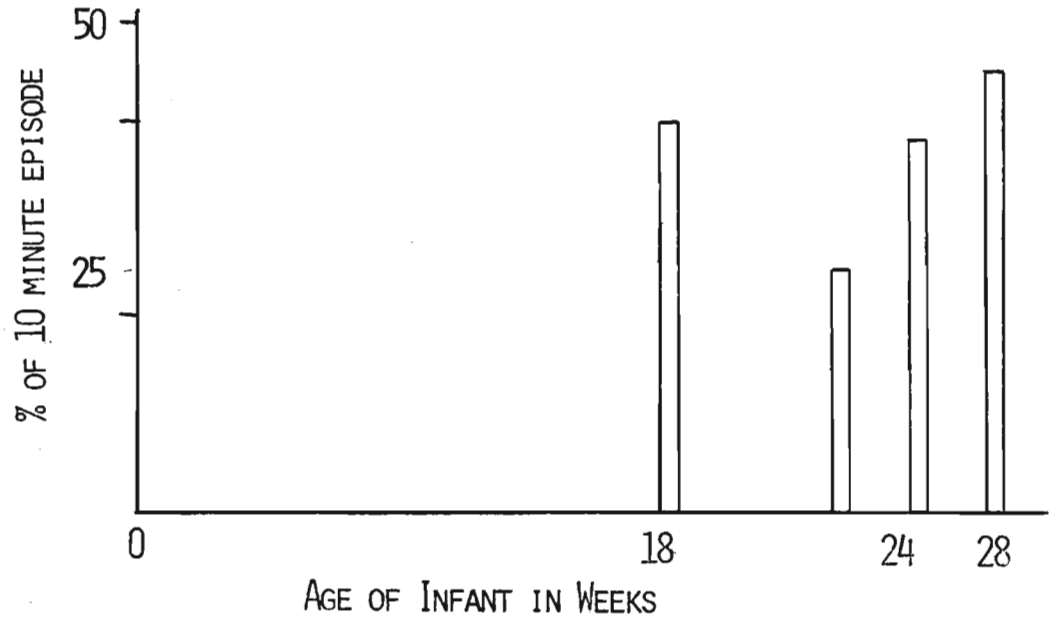

Figure 20 Percentage of Time in each Ten Minute Episode Infant Looked at Objects Presented by Mother.

Dyad 2: Sarah and mother.

Sarah was 00:23:05 when filmed for the first time. At this age she was in stage III of the postulated developmental sequence.

The following description of an interactive sequence supports the above categorization.

No.	M/I	AGE 00:23:05 STAGE III Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	M	Sitting on chair with Sarah on her knee. Holds up doll in front of Sarah's face - alternating gaze between doll and infant.	M_n	$III_{15,3}$	g//s	
2	I	Reaches over and grasps the doll's hand looking directly at doll. Glances down at her hand then back at the doll. Looks up towards the ceiling.		P	gs//	✓
3	M	Looks from Sarah's face in the direction of her gaze and then bends to Sarah. Whispers into Sarah's ear - looks at Sarah.		P	s//gp//s	✓
4	I	Leans back against mother, maintaining gaze at ceiling.			go	
5	M	Looks again in direction of Sarah's gaze and back at Sarah. Holds the doll up in front of Sarah.	M_n	$III_{15,3}$	s//gp//s//g	✓
6	I	Looks at doll.		P	gs	✓
7	M	Waggles doll - watching Sarah intently.	M_n	$III_{3,15}$	s	✓

No.	M/I	AGE 00:23:05 STAGE III Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
8	I	Gaze averted from doll - leans back against mother.				
9	M	Drops rag doll. Presents squeaky doll. "Look at this." Alternates gaze from doll to infant to doll. Squeaks doll.	M_{nn}	$I_{3,15}$	gs//s//gs	✓
10	I	Looks rapidly at doll - slight frown.		P	gs//	✓
11	M	Again squeaks doll. Watching Sarah. "Ooh." Laughs.	M_n	$III_{3,15}$	Vs+	✓
12	I	Watches doll intently.		P	gs	✓
13	M	Again squeaks doll - watching Sarah's face.	M_n	$III_{3,15}$	s	✓
14	I	Blinks rapidly - maintains gaze on doll.		P	gs	✓
15	M	Shakes doll and brings it forward to touch Sarah on the cheek. Watching Sarah's face.	M_n	III_3	gs// s	✓
16	I	Closes eyes, laughs.	M_n	P	V+	✓
17	M	Repeats demonstration of the squeak.	M_n	III_{15}	s//gs//s	✓
18	I	Watches without blinking.		P	gs	✓
19	M	Squeaks doll. Touches Sarah on cheek with the head of the doll. Says "Boo".	M_n	II_{15}	Vs//gs//s	✓
20	I	Laughs - watching intently. Leans back.	M_n	P	V+gs	✓
21	M	Repeats the sequence.	M_n	III_{15}	s//gs//s	✓
22	I	Laughs.	M_n	P	V+gs	✓
23	M	Repeats the sequence but delays the final "boom" after the squeak of the doll.	M_n	II_{15}	s//gs//s	✓

No.	M/I	AGE 00:23:05 STAGE III Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
24	I	Watches intently - frowns at the delay.	M_n	P	gs	✓
25	M	Repeats again. Omits the "boom"	M_n	III_{15}	$s//_{gs//_s}$	✓
26	I	Withdraws slightly, eyes wide, mouth open. Wriggles.		P	gs	✓
27	M	"Boom" - touches Sarah on cheek.	M_n	II_{15}	Vs	✓
28	I	Laughs.	M_n	P	V+gs	✓

This sequence was repeated for a further three times, in each one the delay between the 'squeak' and the 'boom' was present.

There was no evidence yet of intersubjectivity. Sarah did not once alternate her gazes between object and mother although she did alternate her gaze (elements 2, 6) between objects.

As in the previous dyad, the presentations of objects to the infant by the mother were varied to maintain the infant's attention. The 'boom' game introduced by the mother also showed hesitations which, as has already been suggested, are important in the development of representation.

Sarah's behaviour in elements 24 and 26 showed that she anticipated the completion of the sequence. One can thus infer that she was operating with stage III significations. This game lasted for 52,8 seconds.

Later in this episode the mother attempted to get Sarah to take an object from her but was unsuccessful:

> The mother picked up a teddy bear and offered it to Sarah. Sarah looked at the bear. The mother then placed the bear against Sarah's chest and positioned Sarah's right arm around it. Sarah's gaze dropped from the bear when it was moved towards her and her arm fell away from it as soon as the mother released it.

Sarah's behaviour at 00:27:05 showed an advance over the previous episode in that there was a more rapid alternation of attention between objects and also a reaching for objects which was combined with vocalizations[1]. However the gaze alternation object-mother-object was still not present.

No.	M/I	AGE 00:27:05 STAGE III Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	I	Looks away from the lorry towards the squeaky doll and then back to the lorry.			$g1 /\!/ g2 /\!/ g1$	
2	M	Holds the doll towards Sarah, looking at Sarah.	M_n	III_3	s	
3	I	Gaze changes from lorry back to doll.		P	$g1 /\!/ g2$	✓
4	M	Pushes the doll towards Sarah. "Ta". Maintains gaze at Sarah.	M_n	II_3	Ws	✓
5	I	Looking at the doll, reaches for it with her left hand, takes hold of it, vocalizes.	M_n	III_4	V_{g2}	✓
6	M	Lets go of doll which drops to the floor - looking at Sarah.		P	s	✓
7	I	Again looks at the lorry then back to the doll - pulls the doll towards her.		P	$g1 // g2$	✓
8	M	Looking at Sarah. "It's a ba-ba. It's a ba-ba".	M_{nn}	I_6	s	✓
9	I	Looks at the pompons on the doll's feet.		P	g2	✓

[1] This relationship of a vocalization with a specific action was not consistently maintained.

No.	M/I	AGE 00:27:05 STAGE III Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
10	M	Immediately leans forward and touches one with her index finger, looking from these to Sarah.	M_n	III_8	$g2//_s$	✓
11	I	Looks back at the doll's face.		P	g_2	✓
12	M	Picks up the doll and starts an "ah-boom" game with it.		P	$g2//_s$	✓
		A little later the following interaction occurs:				
13	M	Places doll in front of Sarah, looking at Sarah.	M_n	III_3	s	
14	I	Grasps doll with both hands and pulls it towards her mouth. Looks from the doll to mother's face.	M_n	III_4	$g2//_s$	✓
15	M	Inhales deeply and noisily a few times.		P	s	✓
16	I	Watching her, laughs. Looks back at doll. Drops the doll and looks at the lorry.	M_n	P	$V+s//_{g2}//_{g1}$	✓
17	M	Picks up the doll, glances at Sarah and transfers her grasp to the lorry which she pushes towards Sarah. "Is this what you want?"	M_{nn}	I_3	$g2//_s//_{g1}$	✓
18	I	Reaches for it and grasps it. Attention fixed on it ...	M_n	III_4	g2	✓

In element 14 Sarah changed her gaze from an object to the mother's face but she did not return it to the object until element 16. However, there were instances of rapid alternation of attention between objects and parts of objects (elements 1, 3, 7, 9, 16).

The sensitivity[1] with which the mother monitored Sarah's attention was evident in elements 4, 10, 17. That the mother so frequently provided the goals after which Sarah was striving, for example handing objects that she reached for or looked at, must be important in the differentiation and eventual synthesis, which appeared in embryonic form in this episode, of the social world and the natural world. Although there were advances in both social and cognitive spheres obvious limitations still existed. Sarah was still immobile and her co-ordinations were immature, many of her reaches towards objects were unsuccessful and even when she had grasped objects they often fell from her grasp. In spite of the dominant part vision plays in an infant's contact with the world, once an object was grasped, Sarah carried it to her mouth and did not hold it up for visual inspection. The sequence is visual attention, prehension, object taken to the mouth[2].

There was increasing evidence of vocalization in Sarah's communicative actions. In this ten minute sequence Sarah looked at, reached toward an object and vocalized fourteen times. On each of these occasions the mother retrieved the object desired and handed it to her. The object was identified by direction of gaze, the mother's attention was obtained by the vocalization and the desire was expressed in the gesture. There was no phonetic consistency in these vocalizations. These could not therefore be classified as phonetically consistent forms (PCF) (Dore et al 1976). This refinement of the acoustic string

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[1] A recent paper by Schaffer & Crook (in press) provides an excellent account of the role of the mother in early social development.

[2] This sequence is well illustrated in two films made by Bruner: "Cup to Lip" (1974) and "Early Intentions" (1974) and is discussed in Bruner (1969).

is not necessary, at this stage, for the effective functioning of the communicative action. Stable PCF/morpheme-conventional meaning relationships become necessary when gestures and situations are not present to provide the cues.

12.1.1.4 Stage IV

The next episode at 00:29:05 showed the first appearance of intersubjectivity, i.e. stage IV behaviour.

No.	M/I	AGE 00:29:05 STAGE IV Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	M	Both mother and infant are sitting on the floor, both with a hand on the wooden lorry. Looks from Sarah to the lorry then back to Sarah.		P	$s//_{gl}//_{s}$	✓
2	I	Staring fixedly at lorry, which she pushes onto its side.			g^{l}	
3	M	Looking at Sarah. "Where's the ba-ba? Where's the ba-ba?" (Referring to the 'driver' of the lorry.)	M_{nn}	I_{24}	s	✓
4	I	Looks from the lorry to the mother then back to the lorry.		P	$g\!\!\not/_{s}//_{gl}$	✓
5	M	Turns one of the wheels of the lorry with her right hand - looking at the lorry.		P	g^{l}	✓
6	I	Looks up at the mother, vocalizes, then looks at the lorry. Touches the lorry with her left hand. Looks up at the mother and vocalizes.		P	$Vs//_{gl}//_{s}$	✓

No.	M/I	AGE 00:29:05 STAGE IV Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
7	M	Imitates this last vocalization, looking at Sarah.		P_{23}	s	✓
8	I	Scans the floor, turns and looks over her left shoulder.			E	
9	M	Follows the line of regard and stretches over to pull into play a second lorry. "Look, there's a driver in this one". She takes the block out of lorry B and places it in lorry A. Looks up at Sarah.	M_{nn}	$I_{15,7}$	$gf//_s$	✓
10	I	Stretches forward with both hands towards the lorry and pushes it - glances up at mother then back to the lorry.		P	$g//_s//_{g1}$	✓
11	M	Moves her position, still looking at infant.		P	s	✓
12	I	Immediately looks up at her then back to the lorry. Changes her gaze to the cup toy.		P	$s//_{g1}//_{g2}$	✓
13	M	Picks up the cup toy and places it in front of Sarah.	M_n	$III_{3,15}$	g_2	✓
14	I	Looks from the cup toy to the lorry and back to the cup toy.		P	$g_2//_{g1}//_{g2}$	✓
15	M	Dismantles cup toy.	M_n	III_{15}	g2	✓
16	I	Looking at the cup toy, stretches towards it.		P	g2	✓
17	M	Sits back, watching Sarah.		P	s	✓
18	I	Looks towards the lorry and then back to the cup toy which she is now holding. Vocalizes.		? III_1	$Vg1//_{g2}$	✓
19	M	Tips some of the cups onto the floor. Looks at Sarah.		$III_{3,12}$	$g2/_s$	✓

No.	M/I	AGE 00:29:05 STAGE IV Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
20	I	Watches intently, vocalizes, reaches towards them and leans on one of the cups. Looks from the cup toy to the lorry and back again.		?III$_4$	Vg2//g1//g2	✓
21	M	"What you got Sarah?" looking at Sarah.	M$_{nn}$	I$_{24}$	Ws	✓
22	I	Immediately looks up at mother.		P	s	
23	M	"What you got?" nodding her head, looking at Sarah.	M$_{nn}$	I$_{24}$	Ws	
24	I	Maintains gaze and then looks back at the cup toy.		P	s//g2	
25	M	Sits forward, gathering the cups. "These are a bit sharp" - puts them behind her back. Looks at Sarah.	M$_{nn}$	I$_7$	Wg2//s	

This episode illustrates the frequency and proficiency of Sarah's alternating attention between mother and objects (elements 4, 6, 10, 12, 24). The glances at the mother were brief and appeared to be of the nature of checking the mother's direction of attention: the activity or interest in the object was not lost. Thus stage IV has been reached.

A point which must be mentioned but which has been in evidence for some time is the ease with which the mother can now attract the infant's attention either to herself or to an object she presents to her. It is interesting that the majority of objects presented are ones which the infant had herself 'selected' visually from the numerous objects present. This has been reported by Collis (1977) and Schaffer (1977).

This episode marked an important change in the options available to the

infant - she could now communicate about objects to the mother. Intersubjectivity could now be said to be present: however, as with most new behaviours, this would go through a period of consolidation and in one later episode (00:36:03) the mother/object gaze alternation did not appear at all. This does not necessarily mean a regression in the quality of social interactions but rather that the nature of their interactions in this episode did not elicit it.

At 00:32:00 there were no major changes evident in the social structures. The mother's verbalizations were more specific to the objects of joint activity and there was increasing emphasis on labelling, for example: "What's that? Dog", as she picked up a dog. There were no instances in this episode of the mother demonstrating either activities which she intended Sarah to imitate or of complex object relationships, for example, block towers.

The social structures developed in this dyad showed no major reorganization at 00:36:03 although there were refinements and subtle changes in interaction which suggested that a major reorganization was imminent. The visual perception-prehension-mouth relationship was still present and on a number of occasions when Sarah was actually stretching towards an object with an object already in her hand she reversed the movement and placed the held object into her mouth, as the following description illustrates.

> Infant picks up one of the rings from the ring toy and then grabs the peg of the ring toy and pulls it towards her, while the mother watches intently. The infant then drops the ring and picks up the ball from the top of the peg. She looks from the ball to the peg then back to the ball. She brings the ball across and bangs it onto the peg, then looks up at mother. Mother responds with: "You're clever, hey?", smiling at the infant. Infant looks again from the peg to the ball, stretches out with the ball in her hand and then changes direction and places the ball in her mouth - still looking at the peg.

In the following episode (00:40:03) there was evidence of reciprocal vocalizations (elements 17, 18, 19; 45, 46; 48, 49, 50, 51, 52) but no phonetically consistent forms were present. The infant's alternation of gaze between mother and object was very obvious and present on a number of occasions (elements 8, 18, 24, 26, 30). There were two important changes in the mother's behaviour. Firstly, she demonstrated certain activities to be carried out on an object, for example the rag doll. She held it to her chest, patted its back and rocked slightly, saying, "Poor baby. Baby's crying", then attempted to get Sarah to copy this (element 43). She also, when the doll was on the floor, patted it on its tummy, saying, "Poor baby. Doo-doo", and made other similar remarks (elements 29, 45). There were three instances in which Sarah copied these behaviours with rather gross slapping movements onto the doll (elements 30, 52, 58). It would appear that this dyad was in a transitional stage between stages IV and V. And, secondly, on a few occasions when the mother spoke, Sarah immediately responded by looking at her (elements 18, 22, 24, 30, 34, 42). This is a dimension of interaction which was not consistently present previously. This convention is an essential feature of conversation.

During this ten minute session the mother, on four occasions, built a tower with the cups and presented the completed tower to Sarah. On each occasion Sarah made gross reaching movements towards it and knocked it down. There was no evidence of co-operative activity.

Sarah was just beginning to stand and on three occasions the mother attempted to get her to take a step by holding out a desired object to her and keeping it just out of her reach. Sarah's standing was very precarious and seemed to require all her attention, which reduced her attention on either mother or object.

No.	M/I	AGE 00:40:03 STAGE IV Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
		Mother and Sarah are sitting on the floor, Sarah playing with the ring toy.				

No.	M/I	AGE 00:40;03 STAGE IV Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	M	Picks up a doll, places it against the chair in front of Sarah, and says, "Look at all the babas. Look at the baba." Places it down, points at it, and as she withdraws her hand, looks at Sarah, saying, "What's that?"	M_{nn}	$I_{6,8}$	$Wg^{1}//_{s}$	✓
2	I	Looking at the toy, does not respond to mother.				
3	M	Says, "Baba", still looking at Sarah.	M_{nn}	II_{6}	Ws	✓
4	I	Sits back slightly.				
5	M	Repeats "Baba", and begins to push the train backwards and forwards. Still looking at Sarah.	M_{nn}	II_{6}	Ws	✓
6	I	Looks from the doll to the train.		P	$g1//_{g2}$	✓
7	M	Pushes the train in front of Sarah.	M_{n}	$III_{3,15}$	g2	✓
8	I	Watches it passing in front of her and back again, then glances up at the mother, then back at the train.		P	$g2//_{s}//_{g2}$	✓
9	M	Stops pushing the train. Leans on one hand, looking intently at Sarah.		P	s	✓
10	I	Changes her direction of gaze to the doll. She vocalizes, leans forward towards the doll.		P	$Vs//_{g1}$	✓
11	M	Immediately changes her gaze to the doll as well.		P	g1	✓

No.	M/I	AGE 00:40:03 STAGE IV Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
12	I	Vocalizes again, pushes the ring toy out of the way, still looking at the doll.		P	Vg1	✓
13	M	Assists her to move the ring toy, looking at the objects.		P_{16}	g3	✓
14	I	Sarah's attention is now directed onto the ring toy, leaning forward towards the doll.		P	g3	✓
15	M	Leans forward, touches the doll with her right hand and says, "Look. What's this?" Picks the doll up, looks at Sarah, and demonstrates the squeak of the doll.	M_{nn}	$I_{8,15}$	$Wg1//_{s}//_{g1}$	✓
16	I	Immediately looks up from the ring toy to the doll.		P	$g3//_{g1}$	✓
17	M	Watching Sarah intently. Withdraws her hand, looking at Sarah, chuckles, and says, "Is the baby crying?" She again picks up the doll, saying "What's this?" Demonstrates the squeak - "Listen to the baby" - and as she puts the doll down, she bounces it up and down a few times and it squeaks as it bounces. She is watching Sarah intently.	M_{nn} M_{nn} M_{nn}	I_{7} I_{18} I_{15}	$Ws//_{g1}//_{s}$	✓
18	I	Looking at the doll. Vocalizes, stretches forward with her right hand, looks up at the mother as		P	$V^{g1}//_{s}$	✓
19	M	Says "Ah, listen to the baby. Is the baby crying?"	M_{nn}	I_{17}	Ws	

No.	M/I	AGE 00:40:03 STAGE IV Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
20	I	Sits back, looks back at the doll, leans towards it, reaches out, touches the doll with her right hand, then with her left hand.		P	g^1	✓
21	M	Watching intently, saying "Baba".	M_{nn}	II_6	Ws	✓
22	I	Looks up at her.		P	s	✓
23	M	Says, "Is the baby crying?" "What's that?" She leans forward with her right hand, takes the doll and again demonstrates the squeak.	M_{nn}	$I_{7,15}$	Ws	✓
24	I	Looks up at the mother as		P	s	✓
25	M	Says, "What's that, Sarah?"	M_{nn}	I_7	Ws	✓
26	I	Looks back at the doll.		P	g1	✓
27	M	Demonstrates the squeak again, looking at Sarah.	M_n	$III_{3,15}$	s	✓
28	I	Stretches towards the doll, takes it from the mother, and pats its back, to make it squeak.	M_n	III_4	g1	✓
29	M	Immediately leans forward, patting the doll, imitating Sarah's movements, and says "Doo-doo. Doo-doo, baba. Doo-doo, baba", smiling at Sarah.	M_{nn}	$I_{23,15}$	Ws+	✓
30	I	Watches the mother while she says this, then laughs and slaps the doll heavily. She again looks up at the mother, then back at the doll.		III_{23}	$v^s//_g\,v/_s$	✓
31	M	Sits up.				
32	I	Looks at her again.		P	s	✓

No.	M/I	AGE 00:40:03 STAGE IV Description	mm/mnn	P,I,II III	Coded Beh.	Approp.
33	M	Moves Sarah round to face the camera. Again demonstrates the doll's squeak, saying, "Ah, listen." Looking at Sarah.	M_{nn}	$I_{14,15}$	Ws	✓
34	I	Looking up at the mother.		P	s	✓
35	M	Says, "Baba", looking at Sarah.	M_{nn}	II_{6}	s	✓
36	I	Looks from the mother to the doll and then up at the ceiling.		P	$s//_{g}!//_{E}$	✓
37	M	Demonstrates the squeak again.	M_{n}	III_{15}	s	✓
38	I	Chuckles, looks down towards the doll, as	M_{n}	P	Vg"	✓
39	M	Looks up in the direction of Sarah's previous gaze, then looks back at Sarah. Again demonstrates the squeak.	M_{n}	III_{15}	$gf//_{s}$	✓
40	I	Looking at the doll.		P	g!	✓
41	M	Laughs, saying "Is the baba crying?"	M_{nn}	I_{7}	Ws	✓
42	I	Immediately looks up at her.		P	s	✓
43	M	Takes the doll, holds it against her chest, saying "Poor baba", patting it on its back. She then leans forward.	M_{nn}	$I_{15,7}$	Ws	✓
44	I	Watching the doll now.		P	g!	✓
45	M	Says to Sarah, "Love the baba. Pat the baba." She lies the doll on Sarah's knee, and pats it, saying "Doo-doos, baba".	M_{nn}	$I_{14,15}$	$Ws//_{g}//_{s}$	✓
46	I	Puts her left hand over the doll's face and vocalizes, looking at the doll intently.		P	Vg!	✓

No.	M/I	AGE 00:40:03 STAGE IV Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
47	M	Watching Sarah. She goes on patting the doll and then sits back slightly.	M_n	III_{15}	s	✓
48	I	Vocalizes, looking at the doll.		P	Vgl	✓
49	M	Says, "Do you like her? Do you like her, hmm?" - looking at Sarah.	M_{nn}	I_{17}	Ws	✓
50	I	Immediately looks up at the mother's face. Vocalizes, looks up at the ceiling.		P	$Vs//_E$	✓
51	M	Vocalizes again - "Hmm?" - looking at Sarah.	M_n	III_{25}	Vs	✓
52	I	Looks at her, then again up at the ceiling. While she pats the doll looking up at the ceiling, she vocalizes again.		P	$Vs//_E$	✓
53	M	Follows her gaze, then looks back at the doll, saying "Baba".	M_{nn}	II_6	$gf//_{gl}$	✓
54	I	Looks from the doll, to the mother, to the ceiling.		P	$gV/_{s}//_E$	✓
55	M	Says, "Where's the baba?" and touches Sarah's hand, tickles her tummy. Again repeats, "Where's the baba?"	M_{nn}	I_8	Ws	✓
56	I	Now looks down onto the floor.				
57	M	Picks up a second doll.				
58	I	Gaze is now directed back onto the squeaking doll. She vocalizes and slaps the doll.		P	Vgl	✓
59	M	Looks back at her.		P	s	✓

With Sarah aged 00:43:00 the mother again used an object, the red ball from the top of the ring toy, to entice Sarah into a standing position and then to get her to take a step (elements 24, 28, 30, 32, 34). This is an excellent example of how a mother leads her infant into new behaviours thus contributing to the dynamic of development.

Sarah's alternation of attention between objects and between mother and object was now well established (e.g. elements 11, 13): this enabled more complex rounds of communication to be established in which both actions and objects were included, for example elements 14-25. The ball was the focus of the infant's attention and the mother used this to elicit a behaviour (standing and walking) from Sarah.

Although not evident in this excerpt, Sarah was still putting the majority of objects retrieved into her mouth. The other presentations of objects made by the mother during this ten minute episode were of objects towards which she tried to direct Sarah's *attention*, not an attempt to get Sarah to take the object from her.

On four occasions the mother built a tower to which she drew Sarah's attention - on each occasion Sarah knocked the tower over. It was impossible to determine whether these demolitions were intentional or not. Sarah may have been trying to remove one or two of the top blocks but her motor movements were not yet skilled enough to enable her to do this.

This interaction did not, according to the criteria established, conform to stage V behaviour, however it did show some advance over earlier interactions. The mother's behaviour was directed mainly towards eliciting certain actions (walking, standing) from Sarah and she did not spend much time in demonstrating relationships between objects.

No.	M/I	AGE 00:43:00 STAGE IV Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	I	Crawls over towards the ring toy.				
2	M	Puts down the doll that she had been holding up in front of Sarah. She says "You're not really interested. You just want that little red ball", and she stretches over with her right hand to support the ring toy.	M_{nn}	$I_{16,17}$	$Ws//_{g}$	✓
3	I	Stretches with her right hand to retrieve the red ball on the top of the peg. She can't pull it off.				
4	M	Assisting, by holding the base and twisting it. Then lets go the ring toy. Looks at Sarah.		P_{16}	$g//_{s}$	✓
5	I	Still struggling to get the ball off.				
6	M	Moves her position so that she can use both hands, and takes the ball off for Sarah, then tips all the rings onto the floor in front of Sarah, and whistles.		III_{16}	$g^{1}//_{s}$	✓
7	I	Looks up at the mother, then down at the bundle of rings.		P	$s//_{g1}$	✓
8	M	Sits back, pulling 3 or 4 of the rings with her.		P	g	✓
9	I	Looks from the red ball to the rings the mother is moving backwards.		P	$g2//_{g1}$	✓

No.	M/I	AGE 00:43:00 STAGE IV Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
10	M	Rolls a ring towards Sarah, saying "Look. What's that?" Looks at Sarah.	M_{nn}	$I_{3,15}$	$g1//_s$	✓
11	I	Watching. Looks from the mother's hand to the ring which has landed near her knee.		P	$gs//_{g1}$	✓
12	M	Rolls another ring. Looks back at Sarah.		$III_{3,15}$	$g1//_s$	✓
13	I	Again looks at the mother's hand, and then back at the red ball, then back at the mother's face.		P	$gs//_{g2}//_s$	✓
14	M	Says, "What's that?" - stretching forward with her left hand to take the ball from Sarah, as she says "Ballie". Moves the ring backwards, then rolls the ball towards Sarah. Looks at Sarah.	M_{nn} M_{nn}	I_{24} $II_{3,6}$	$Wg2//_s$	✓
15	I	Leans forward, grabs it, and the mother says	M_n	III_4	g2	✓
16	M	"Ta." She picks the ball up just before Sarah can grab it. Looking at Sarah intently, and says "Say 'Ta'", with an exaggerated intonation.	M_{nn}	II_{17} I_{14}	Ws	✓
17	I	Looking up at the mother's face.		P	s	✓
18	M	Then holds the ball out on the end of her finger towards Sarah with her palm uppermost.	M_n	III_3	s	✓
19	I	Looking at the ball.		P	g2	✓
20	M	Says "Ta. Ta, mommy. Come on."	M_{nn}	$I_{3,14}$	Ws	✓
21	I	Leans forward with left hand out.				

No.	M/I	AGE 00:43:00 STAGE IV Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
22	M	Withdraws slightly, hand still held out, looking at Sarah.	M_n	III_3	s	✓
23	I	Vocalizes.		P	Vg2	✓
24	M	Lifts the ball up slightly, watching Sarah and smiling. She is trying to entice Sarah onto her feet. She says "Ta" again. Sits back. Leans forward with her right hand to support Sarah. "Come on", as she lifts Sarah into the standing position. She then holds the ball in front of Sarah, saying "Ta", with her right hand out protectively, in case Sarah should slip.	M_{nn} M_{nn}	II_3 I_{10} II_{10}	W+s	✓
25	I	Takes a step forward and then topples over backwards.		P	gs	✓
26	M	Laughs. Moves a few of the objects and then again tries to get Sarah into a standing position. She pulls Sarah up saying "Come on", holding the red ball out again.	M_{nn}	I_{10}	W+s	✓
27	I	Looking directly at the red ball. She vocalizes and stretches towards it.	M_n	II_1	Vg2	✓
28	M	Again says "Ta - Ta, Sarah", holding the ball up in front of Sarah's face, and supporting Sarah with her right hand. She lets Sarah go, repeating "Ta", looking intently at Sarah's face. "Ta."	M_{nn} M_{nn}	$I_{3,6}$ II_3	Ws	✓

No.	M/I	AGE 00:43:00 STAGE IV Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
29	I	Stretches forward with her right hand outstretched.	M_n	III_1	gs	✓
30	M	Moves the ball back slightly, trying to get Sarah to take a step. "Come on."	M_{nn}	I_{10}	W_s	✓
31	I	Takes a step, again with the right hand outstretched towards the ball.	M_n	III_1	gs	✓
32	M	Says "Come on. Ta."	M_{nn}	I_{10}	Ws	✓
33	I	Manages to get hold of the ball	M_n	III_1	gs	✓
34	M	Withdraws it again, and leans towards Sarah and says "Come on. Just one little step. One little step. Come on."	M_{nn}	I_{10}	Ws	✓
35	I	Then stretches forward with her left hand and again overbalances, vocalizing as she does so.	M_n	III_1	Vgs	✓
36	M	Laughs.	M_n	P	+s	✓
37	I	Begins to cry.	M_n	P	V_c	✓
38	M	Touches Sarah's tummy, saying "There you are" - giving her the ball. "Don't be cross, don't be cross", leaning forward directly in front of Sarah's face and smiling. Again says "Ta", looking from the ball to Sarah's face.	M_{nn} M_{nn}	$I_{3,17}$ II_{15}	Ws+//g2//s	✓
39	I	Looks up at the mother, then back at the ball, and reaches for the ball.	M_n	III_4	s//g2	✓
40	M	Repeats "Ta" three times.	M_{nn}	II_{15}	Ws//	✓

The episodes with Sarah aged 00:44:00 and 00:46:00 were also difficult to categorize but both reflected the increasing abilities of the infant. The brief demonstrations of ball bouncing, tower building, etc., were consistent with stage V behaviour. The inability of Sarah to carry out the demonstrated tasks reflected her lack of motor co-ordination and could also have reflected a lack of cognitive ability.

At 00:44:00 the mother, in presenting objects to the child, rolled them towards Sarah or placed them some distance from her. Sarah did not actually reach for them but she did follow the mother's movements. The rings obviously went in different directions and Sarah managed to visually follow to the end point of each of the rolls. Again there were a lot of interactions with the squeaky doll, the mother demonstrating, patting, "doo-doo baba", and so on. Sarah was still putting objects into her mouth. Her gaze alternation was accurate to the degree that she followed the mother's hand in picking up a ring, followed the mother's hand plus ring as the mother withdrew to roll the ring, and then followed the direction of the ring once it had been rolled. She frequently looked at the mother when the mother talked.

Although the mother attempted to present an object at the previous session, and had repeated this sort of behaviour on this tape, her main intention still did not seem to be to get the child to take the object, but rather to encourage the child to stand and then follow an object as she withdrew it slightly.

Sarah was crawling quite expertly, even while carrying objects in her hand, and her motor movements were much more skilled. She could now remove blocks from the tower that the mother was building without knocking the whole tower over.

In the space of two weeks, by 00:46:00, Sarah had managed to achieve standing and fairly accurate walking. She still walked with her arms outstretched but could transverse the room without falling over. The mother's behaviour had obviously changed to accommodate this rather dramatic advance in Sarah's behaviour.

Sarah was vocalizing much more now. She still showed the behaviour of holding objects in her hand and reaching for other objects without first putting these previously held objects down.

There was an interesting episode which gave an indication of Sarah's level of cognitive functioning. She bent down to play with the cup toy, and the biggest cup she immediately picked up and took to her mouth as if to drink something from it. She got her mouth quite accurately over the brim of the cup and made swallowing movements. The mother laughed and said, "What are you trying to do, Sarah? Are you trying to drink something? It's all gone, all gone", and she took the cup from Sarah. Sarah immediately picked it up and repeated this drinking behaviour. The mother repeated, "It's all gone, sweetheart, all gone", and took the cup from her again. This behaviour is indicative of stage III significations.

During this session the mother also demonstrated ball bouncing to Sarah. She rolled the ball to Sarah and tried to get Sarah to retrieve it. This was only partially successful. On the few occasions that Sarah did retrieve it she did not return it to the mother.

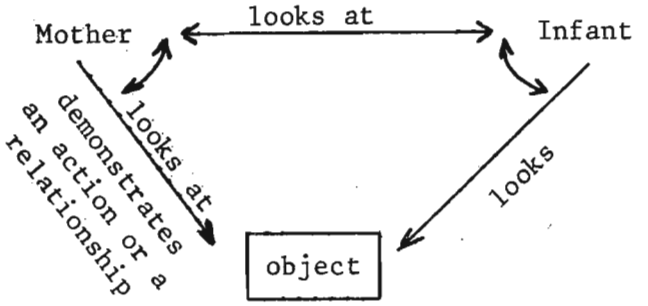
So it would seem that there were no fundamental changes in social structure, although Sarah was much more mobile and her motor movements were becoming increasingly skilled. The behaviour was still characteristic of stage IV. The mother continued to demonstrate specific relationships in actions of objects, for example, wheel rolling of the trucks, the relationship between the cups, and so on. Sarah's movements in response continued to be mainly large patting or swiping movements. When the mother took objects from Sarah she frequently accompanied this with "Ta, ta". She did not attempt to give objects to Sarah or to get Sarah to return objects to her. This occurred in the next session when Sarah was 00:48:02.

12.1.2 The Developmental Stages Which Follow the Establishment of Intersubjectivity.

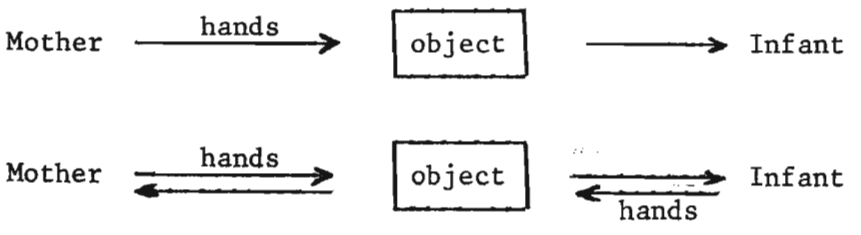
The stages in development of the social structures which follow the establishment of intersubjectivity (stage IV) are not as clearly demarcated as the first four stages. They represent a development towards co-operative activity on objects, for example building a tower, and are best seen as the integration of laws of the natural world with rules of the social world. Objects play an increasing role in mother-infant interactions and in most of the subsequent episodes they form the focal point of the interactions.

The stages are as follows:

Stage V



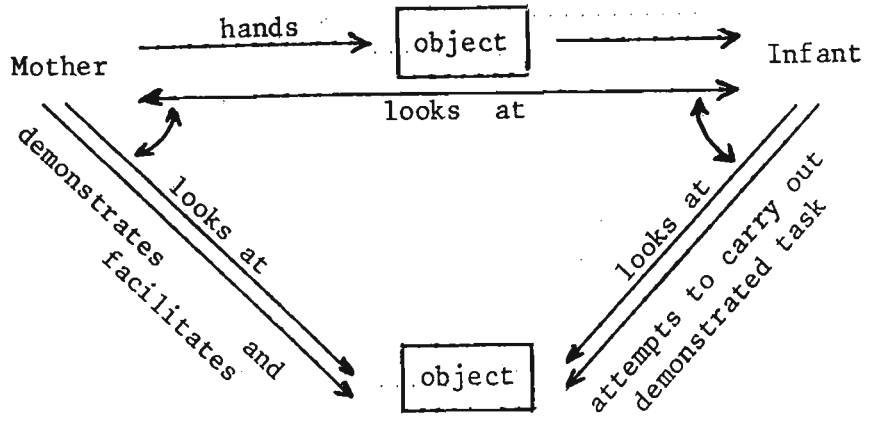
A 'game' which occurs during the stage V period is that of handing objects to the infant and then eliciting their return. These objects are seldom incorporated into any other activity, for example tower building. The emphasis is on the transfer of objects from mother to infant and later reciprocated by the infant. It can be diagrammatically represented thus:



Giving and taking contributes to 'decontextualizing' objects which would

facilitate later achievement of predication and reference.

Stage VI



Stage VII Mother and infant co-operate in completing a task on objects.

It is obvious from the descriptions which precede this that although, at different stages, a specific target behaviour predominates in their interaction, elements which form part of later target behaviours may also be present, for example before stage IV had been achieved certain behaviours of the mother could be seen as appropriate for stage V behaviour, e.g. demonstration of relationships between objects. However the infant's responses to these indicated that she was not yet able to assimilate them into her cognitive or social structures. These maternal actions could not therefore contribute, at this stage, to the shared social structures. A feature of mothers' behaviour towards their infants is this encouragement towards the achievement of new and more complex behaviours.

12.1.2.1 Stage V.

The interaction at 00:48:02 was characteristic of stage V behaviour although some of Sarah's actions (elements 5, 9, 15, 19, 23, 27) may be seen as precursors of stage VI.

There was no indication of Sarah initiating communicative actions, the majority of her behaviours were reciprocations to the mother's actions. The mother did attempt to get Sarah to take objects (elements 14, 24) and to return objects to her (elements 4, 6, 18); Sarah's responses to most of these were inappropriate. Sarah did not vocalize much during this episode which indicates that reciprocal vocalizations did not yet contribute to the establishment or maintenance of the phatic channel.

During this ten minute session the mother labelled a number of objects which Sarah was either looking at or acting on and also gave the sounds made by the toy animals, e.g. "woof woof woof", etc. Sarah still placed retrieved objects into her mouth but not with the rapidity shown previously. On two occasions she did glance at the object before putting it into her mouth.

No.	$M/_I$	AGE 00:48:02 STAGE V Description	$mn/_{mnn}$	P,I,II III	Coded Beh.	Approp.
1	I	Picks up the cup toy and all the cups fall out. She examines the cup left in her hand while				
2	M	Independently builds a tower of the cups. She reaches forward and takes a small cup out of Sarah's left hand, looking at Sarah, and says "Ta". Places it on her tower.	M_{nn}	$II_{14,15}$	$w^{g}//_{s}//_{g}$	✓
3	I	Looks up from the cup in her hand towards the cup tower.		P	$g//_{g}$	✓
4	M	Says "Ta for Mommy". Repeats this, "Ta for Mommy", holding her left hand out, palm uppermost, looking at Sarah.	M_{nn}	I_1	Ws	✓

No.	M/I	AGE 00:48:02 STAGE V Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
5	I	Looks from the mother's hand to the cup in her hand to the cup toy, and then stretches forward with her left hand and removes the top cup from the tower, without knocking it over.		P	$gs//_{g}//_{g}$	✓
6	M	Continues with her left hand out, says "Ta, ta" - and as	M_{nn}	II_{1}	Ws	✓
7	I	Looks towards the cup in her left hand -		P	g	✓
8	M	Leans forward and takes the cup out of Sarah's right hand and places it onto the tower.	M_{n}	P_{15}	$gs//_{g}$	✓
9	I	With the small cup in her left hand stretches forward towards the tower as though attempting to place it.		P	g	✓
10	M	Takes the biggest cup from Sarah's right hand.	M_{n}	P_{2}	gs	✓
11	I	Drops the little cup as she attempts this and knocks the next cup off the tower. Looks down towards the fallen cup.		P	g	✓
12	M	Bends forward to retrieve them. Picks up 3 cups and places them in position on the tower.	M_{n}	P_{15}	g	✓
13	I	Looking from the cups to the tower as mother places them.		P	$g//_{gf}$	✓
14	M	Then says "There's another one", pointing with her right hand at a cup on her right, looking at Sarah.	M_{nn}	$I_{1,8}$	Ws	✓

No.	M/I	AGE 00:48:02 STAGE V Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
15	I	Meanwhile, looking directly at the tower, stretches forward with her right hand and attempts to take the top cup, as		P	g	✓
16	M	Says, "Okay, one two three".	M_{nn}	I_{17}	Ws	✓
17	I	Vocalizes, with her right hand on the tower, holding the top cup.		P	Vg	✓
18	M	Puts her left hand out, says "Ta, ta".	M_{nn}	II_1	Ws	✓
19	I	Removes the cup, but unfortunately the first 4 cups fall over and she looks towards them as they scatter on the floor.		P	g//g	✓
20	M	Withdraws her hand and retrieves the cups.		P	g	✓
21	I	Picks up a cup.		P	g	✓
22	M	Taps the top of the tower, saying, "Put it there".	M_{nn}	I_{14}	Ws	✓
23	I	Looks at the cup in her hand, stretches forward and drops it, and takes the next cup off.		P	g	✓
24	M	Removes her hand, saying "Ta, ta", and holds a cup out towards Sarah, saying "Ta, ta", looking at Sarah, attempting to keep her hands off the tower.	M_{nn}	II_3	Ws	✓
25	I	Looks from the mother to the tower to the cup that the mother is holding out, and she takes the cup with both hands, as	M_n	P_4	s//g//gs	✓

No.	M/I	AGE 00:48:02 STAGE V Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
26	M	Taps the top of the tower, saying "Put that one on".	M_{nn}	$I_{8,14}$	Ws	✓
27	I	Stretches forward, bangs the tower with the cup, and then removes the top one with her other hand.		P	g	✓
28	M	Attempts to take her hand off, and then says "Ta for Mommy", holding her hand out.	M_{nn}	I_{1}	Ws	✓
29	I	Again removes a cup, ignoring the mother's held-out hand, and then removes the other cups from the tower, then knocks the whole tower over.		P	g	✓
30	M	Watching.				

In the following session the quality of the interactions between Sarah and her mother had changed. Sarah was initiating communicative actions which, although not always entirely clear, did require a reaction from the mother. For this reason the technique of analysis had to be changed slightly to what has been termed a functional analysis. In this analysis an attempt has been made to identify the function which the communicative action was serving in the interaction. The quality of the infant's interactional behaviours had now progressed beyond the stage of almost passive observation of the mother and her actions to the stage where she was actively structuring some of the interactions.

The following example of the analysis sheet and a brief introduction to the additional columns follows:

AGE	STAGE		Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I

The first three columns remain unchanged.

Duplicated columns were used for recording the coding of the infant's and the mother's behaviour. This facilitated analysis. Details of the numerical and alphabetical codes are contained in Appendices IV-VII.

The new column headings are as follows:

CA = Communicative Action. These annotations represent a code of the prominent features (of the total action performed) which serve a communicative function.
e.g. 3 = extended hand palm upwards, $\vec{3}$ = extended hand with extended index finger (point), etc.

F = Function. This refers to the function which the communicative action served in the interaction. This is related to the illocutionary force of the communicative action but the categories used in this research are broader than those employed by Searle (1969).

P/III, II, I indicate, as in the preceding analysis, the presence or absence of linguistic elements in the communicative action. Glosses, which are numerically coded, refine the broad functional categories. They are recorded in the P/III, II, or I columns and summarize the intention served by the communicative act.

Several glosses can subserve one function. For example, expressing approval (20), indicating an object (8), and verbalizing "Yes, that's a hole", all subserve an Heuristic function.

Action Modifiers, as in the preceding section, are entered as subscripts to the C/A.

The following procedure was adopted. Firstly, a detailed description of the behaviour was recorded, the alternation of roles in itself being an index of communication. Functions were then ascribed to the actions. In the case of the infant this was frequently a retrospective ascription in terms of the mother's reaction to the infant's action. The prominent behaviours on which the recognition of the function was based were then identified and recorded. Modifications of these prominent features, for example smiles, gaze direction, etc., were included as subscripts (see appendix VI for a list of these). Finally, the action was classified, according to the quality of linguistic elements present, into either Speech Act, Primitive Speech Act or Pre Speech Act categories.

From now, but especially from stage VI onwards, vocalizations became increasingly important aspects of the infant's communicative actions. In this study no attempt has been made to follow specifically the development of these vocalizations because of the poor quality of the audio recording and because a detailed analysis of these sounds was not essential to the identification of the postulated developmental sequence. This, however, does not preclude an attempt to identify some of the factors which could influence this developmental trend towards increasing reliance on the auditory vocal channel. Some of these suggested factors require empirical investigation to establish their relevance.

1. The infant's secure mobility influences communication in two important ways.

   (i) The distance between the mother and the infant increases often at the infant's initiative. The curiosity[1] of the infant contributes to this. This spatial separation decreases the efficacy of visually dependent communicative acts. By

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[1] This has been discussed by, amongst others, Hutt (1966, 1970), Ainsworth, Bell & Stayten (1974), Ainsworth & Bell (1970).

stage VI of the postulated developmental sequence reciprocal vocalizations are the norm rather than the exception in mother infant interaction, it is plausible therefore to assume that communication will come to depend increasingly on the auditory vocal channel as it is found to be more and more effective in a wider range of situations than visually dependent communication.

(ii) Bipedal locomotion frees the hands for the manipulation of objects. The relevance of this to cognitive development cannot be underestimated. Jane Lancaster (1968) argues for the parallel evolution of tool use and language. Her arguments are plausible and would seem to apply ontogenically as well. With increasing manipulatory skills the complexity of the interactions between mother and infant increases. Objects are no longer just handed to one another but are now manipulated into structures. Rings are fitted in a *specific* order onto a peg, blocks are placed on top of each other to form a tower, pictures in books are referred to. It becomes increasingly necessary to be able to differentiate between objects, some of which are likely to be at a distance from the site of the interaction. "Fetch me the big ring", accompanied by a point in the general direction. "No, not that one, next to it", with appropriate gestures. And eventually the gestures themselves becoming unnecessary and communicative skills reaching the level where absent objects can be referred to without causing confusion.

2. In the expanding social world of the infant (which is related to its increasing maturity and independence) the efficacy of idiosyncratic communicative actions will be reduced. There will be increasing necessity to conform to conventional communicative acts which will incorporate speech. New social contacts will have to be assimilated, by accommodation of the social structures. Where accommodation is impossible the novelty will probably alarm the infant who will return to the mother for reassurance. This return to the familiar will facilitate the necessary accommodation or reorganization

of social structures.

3. From stage VII the infant is in the sixth and final stage of the sensorimotor period outlined by Piaget (1953) and Piaget & Inhelder (1969). The culmination of the sensorimotor period is the appearance of representation. Mental representation contributes to the complexity of cognition and interaction which is a feature of this stage. Single words and two word utterances now replace vocables. The rate of language development is very rapid (see Brown 1973). As the infant's language skills increase, communication becomes increasingly dependent upon the auditory vocal channel.

However it must be emphasized that communication is never entirely dependent, except in isolated incidents, for example telephone conversations, upon the auditory vocal channel. Aspects of the context in which the communication is taking place and gestures and expressions contribute significantly to any communication. The success of utterance acts depends upon conventions (intersubjectivity). In attempting to communicate with a foreigner, one can establish a phatic channel and successfully transmit very limited and concrete messages. The situation is not unlike stage VI and VII of the postulated developmental sequence.

In the following episode (01:02:00) of 35 elements, Sarah initiated three communicative actions with Conative functions. The mother, on the other hand, had six Conative and five Heuristic functions to her credit. Thus it was still the mother who was mainly responsible for the structure of the interaction. Reciprocal vocalizations were clearly evident and could now be seen as contributing to the maintenance of the phatic channel. Two of the three Conative functions attributed to Sarah were accompanied by vocalizations. All Sarah's communicative acts fell into the Pre Speech Act category.

Their behaviour was still characteristic of stage V behaviour.

AGE 01:02:00 STAGE V			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
1	I	Stands up with the squeaky doll under her right arm.										
2	M	Is on the right, sitting on the floor										
3	I	Is looking towards an object in the corner of the room.										
4	M	Picks up the rubber dog and bounces it towards Sarah, going "woof-woof-woof-woof" and bouncing it against her legs, looking intently at Sarah.						V2s	C		19, 15	
5	I	Climbs over the dog and walks rapidly towards the corner of the room, vocalizing as she does so. She gets to the corner of the room, turns round, glances at the bundle of toys standing next to the mother.	V12 E	U								
6	M	Immediately picks up the plastic dog which Sarah had been looking at and says "And there's a big duck".						W2gp//s	H	.		6
7	I	Turns away, scanning the floor. Bends down, picks up the little ball from the ring toy, and vocalizes as she walks towards the mother, holding it out.	▲ V3 E//5	C	3							
8	M	Sits forward, takes the ball from Sarah.						6s	R	4		
9	I	Immediately looks at the mother's face,	OS	U	?1							
10	M	Says "All gone", putting the ring behind her back.						W2s	R			13
11	I	Walks round behind the mother, can't see the ball, turns away.	12		P							
12	M	Immediately picks up the duck, saying "Look, what's this?" Puts the duck down on the floor and slowly moves it towards Sarah going "quack-quack-quack-boom" as she bounces it against her.						W2s	H	15	6	8
13	I	Shuffling her feet, looking from side to side on the floor.										
14	M	Leans towards her and says "are you looking for the ballie?" She tickles Sarah under the chin. "Are you looking for the little ballie?"						W11 s	C	19		17, 24

AGE 01:02:00 STAGE V			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
15	I	Looking up towards the camera, points gestures with her hand and vocalizes.	$V3_g$	C	8, 24							
16	M	Turns, looks in the direction of Sarah's gaze, and says "What's that?" in a high pitched voice.						W gp//$_s$	R			17, 24
17	I	Vocalizes again, waves her left hand up and down, vocalizing, and walks away towards the other side of the room. She vocalizes again.	V7 $\overline{12}$		P							
18	M	Goes "Mmm?" following Sarah's direction visually.						VO_{gf}	C	24		
19	I	Vocalizes again, looking around the room.	V O_E		P							
20	M	Says "Where's the book?" "Where's the book?"						WO_s	C			24
21	I	Looks from the mother to the floor	Os//$_{gp//s}$	R	8							
22	M	Leans forward, picks up the book and says "There's the book. Look. Pretty, pretty. Look."						$W2_{g//s}$	H	8		7,8
23	I	Standing looking at the mother as	O_s		P							
24	M	Opens the book. Bends over, retrieves a second book, puts it on top of the first, alternating gaze between Sarah and book.						$2_{g//s}$	C	15		
25	I	Moves over towards the mother. Looks down on the book.	$\overline{12}$ s//$_g$	R	12							
26	M	Says "Look, look", looking up at Sarah, pointing, "Look"						$W\overrightarrow{3}_s$	C	8	10	
27	I	Moves slowly across the floor, looking at the book.	$\overline{12}_g$	R	12							
28	M	Says "Look, there's a bear", pointing at a picture, looking at Sarah.						$W\overrightarrow{3}_s$	H	8		6,8
29	I	Vocalizes, walks away slightly, moves the doll so that it squeaks.	V $\overline{12}$		P							
30	M	Watching her intently. Says "Aah!" and as she says that -						V O_s	U	25		
31	I	Looks towards her	O_s		P							
32	M	Completes - "Poor baby. Baby's crying".						W O_s	H			7
33	I	Pulls the'baby'up over her shoulder in the conventional way for holding a baby, vocalizes again as she walks towards the mother.	$V_{2\ s}$	R	12							
34	M	Holds out both her hands, saying "Shall Mommy take the baby?"						$W3/3_s$	C			1

AGE 01:02:00 STAGE V			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
35	I	Plonks down on the floor next to her.										

During this session Sarah was very mobile and communicated both vocally and visually with the mother from various points in the playroom. On a few occasions she handed objects back to the mother, sometimes initiating the return and at other times after the mother had requested an object. These "give and take" sequences did not develop into games, as they did with Kerryn and her mother (the third dyad).

Again Sarah seemed preoccupied with the squeaky doll which she carried around with her for most of the ten minute session. On the three occasions on which she went over to fetch the big yellow ball at the request of the mother, she could not pick it up because she still had the doll in her hand. On these occasions, she looked from the ball to the doll to the ball, and selected each time to carry the doll rather than to put the doll down to pick up the ball.

She was very vocal in this episode, vocalizations differing in intonation patterns. Specific sounds 'duz' and 'guz' were evident. She laughed heartily on a few occasions at a game that the mother was playing with the doll.

There were no reciprocal or co-operative ventures evident.

Sarah was also using gestures, open-handed pointing, with vocalizations, which seemed to depict demand and insistent vocalizations when she wanted her mother to fetch objects that she had thrown over the barrier. On each occasion that Sarah did one of these open-handed gestures the mother immediately labelled the object - "Yes, those are lights. There are the lights"; "That's a chair", etc. It would seem that these open-handed gestures were interpreted as primitive points.

The following short extract will give an indication of the reciprocal vocalizations, which were evident in elements 2-6, 8-14, 16-20, 25-26.

AGE 01:06:03 STAGE V			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
1	I	Standing looking over the barrier.										
2	M	Sitting at the far wall, looking at Sarah, says "Throw the ballie, Sarah."						WOs	C			11
3	I	Turns, looks over her shoulder at the mother and vocalizes.	VOs	U	?1, 7,10							
4	M	Points, and says "Ta".						$W\vec{3}_s$	C	8	1	
5	I	Turns back, looks over the barrier, vocalizes sharply and loudly, fretfully. Turns towards the mother and vocalizes again.	$VO_{g//s}$	U	?1, 7,10							
6	M	Goes "Mmm?" with a querying, raised intonation pattern, looking at Sarah.						VO_s	C	24		
7	I	Shakes her head and turns away from the barrier. Looks at mother.	$\vec{9}_s$	U	?							
8	M	Imitates the shake and says "no", looking at Sarah.						$W\vec{9}_s$	R	23	6	
9	I	Then walks over, vocalizes and points with her finger at the wooden slats on the wall.	$V\vec{3}$	C	7,24							
10	M	Says "Yes, that's a hole", looking at Sarah.						WO_s	H			6
11	I	Vocalizes again, turns and looks at the mother.	VO_s	C	24							
12	M	Smiles, and says "Yes", nodding her head emphatically, looking at Sarah.						$W9\uparrow_{+s}$	H		6,20	
13	I	Then walks across the room pointing at the chair, looking at the mother. Walks over to the chair and pokes it with her index finger on the seat a few times, vocalizes, looking at the chair.	$V\vec{3}^{\uparrow}{}_{s//g}$	C	24							
14	M	Responds immediately with "Chair. That's a chair."						WO_s	H			6
15	I	Changes the squeaky doll to her other hand and then tosses it onto the floor and the doll squeaks as it falls. Begins to climb onto the chair.										
16	M	Says "Aah, poor baby".						WO_s	R			17
17	I	Vocalizes and turns towards the doll.	VO_g	R								
18	M	Laughs, looking at Sarah.						VO+s	-	P		

AGE 01:06:03	STAGE V		Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
19	I	Bends down and picks up the doll. Holds it tightly towards her and pats it, vocalizes, walks across the room, holding the doll. Stands at the door, looking over the barrier, holds the chair, and vocalizes, going "Da-da, da".	V2 V2	C	1,10							
20	M	Says "Hoy, hoy", looking at Sarah.						VOs	R	5,13		
21	I	Looks up towards the lights.										
22	M	Claps her hands, looking at Sarah.						3//3$_s$	C	15, 19		
23	I	Looks at her	Os		P							
24	M	Smiles, nods her head, claps her hands again.						9↑,3//3$_{+s}$	C	15, 20		
25	I	Looks back towards the barrier then vocalizes and moves towards the mother, looking at her.	V$\overline{12}$g//$_s$	U	?1, 7,19							
26	M	Leans over and catches her, saying "Come here".						W11$_s$	C	11		11

There were no significant changes in the quality of interaction in this episode.

The mother used, with increasing frequency, conventional gestures and vocalizations in response to Sarah's behaviours, for example the "Mm" in element 6, the head shake plus "No" in element 8, the head nod plus "Yes" in element 12. The latter two examples combined the gesture with its equivalent linguistic form - thus both continuing the interaction and teaching the infant. Labelling of objects was also becoming increasingly evident (elements 10, 14) in their interactions. This labelling reached a peak in book episodes which occurred when the infant was a little older. The directive nature of Sarah's actions were again obvious in this episode (four Conative functions, four unclassifiable functions). The mother's reactions were appropriate and encouraging.

This was the last recording session of this dyad which was analysed.

The following two histograms (Figures 21, 22) represent the relevance of objects to this dyad's interaction. The increasing complexity of

their interaction is evident from the increasing incidence of predication and demonstration evident in Figure 21.

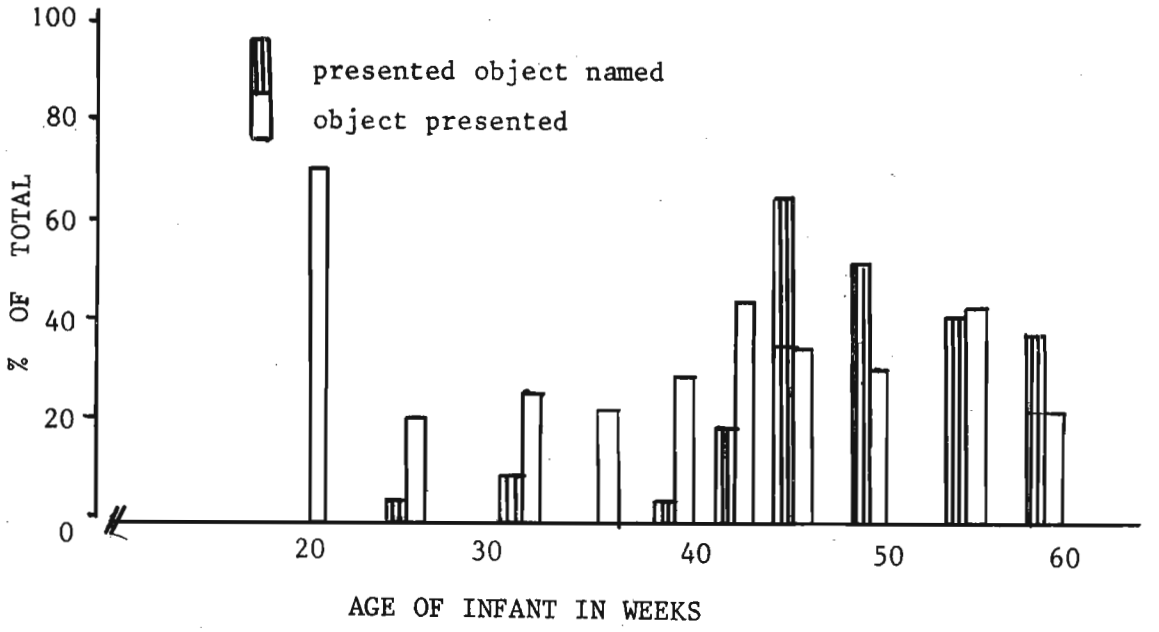


Figure 21 (i) Percentage of Ten Minute Episode in which Objects were held out to the Infant;

(ii) And the Percentage of Times the Presented Object was Named.

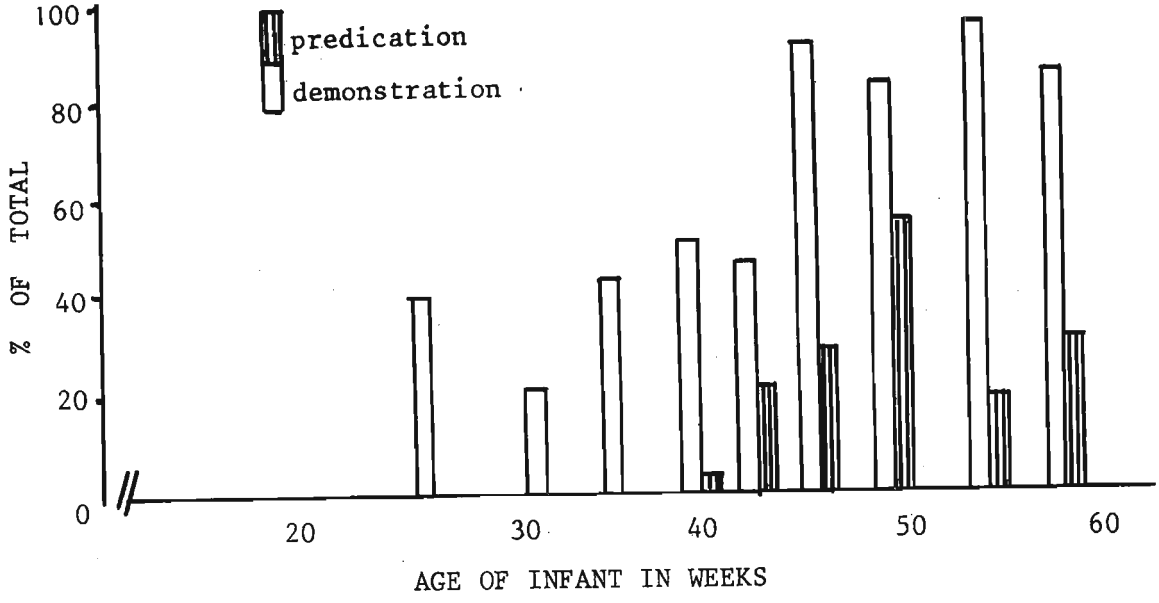


Figure 22 (i) Percentage of Times a Function of the Presented Object was Demonstrated;

(ii) And the Percentage of Times in which Something was Predicated of the Presented Object.

Dyad 3: Kerryn and mother.

At 00:42:00 Kerryn and her mother's interactions were consistent with stage V behaviour. There was therefore no discontinuity in the developmental sequence. Giving and taking of objects was a frequently occurring interaction in this dyad. , Kerryn was not yet initiating any communicative actions. The majority of her reactions were reciprocal or served only to maintain the phatic channel. For this reason, the method of analysis for this first episode has reverted to the earlier method. This was the first occasion on which this dyad was filmed; their behaviour therefore may have been influenced by their strangeness

in the environment.

This was the first dyad to be filmed in this study and the standardized set of toys was not yet available to them. These were introduced when the infant was 01:04:00. Other toys, some of which were constructional, were available. Kerryn did not vocalize much during this first session. There was only one short sequence of reciprocal vocalizations (elements 12, 13, 14, 15, 16).

Kerryn was still placing retrieved objects into her mouth (elements 15, 27, 29, 33) and failing to put down a held object when reaching to retrieve another (elements 15, 27, 33). She showed interest and directed action towards the towers the mother constructed but her actions were destructive rather than constructive.

No.	M/I	AGE 00:42:00 STAGE V Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
1	I	Both mother and Kerryn sitting on the floor, facing each other. Has an object in her right hand.				
2	M	Has an object in each of her hands.				
3	I	Looking intently at the mother's hands. Glances up at the mother's face, then back at the hands.		P	$gs//_s//_{gs}$	✓
4	M	Clears a space in front of Kerryn and places two blocks, one on top of each other. Glances at Kerryn.	M_n	III_{15}	$g//_s$	✓
5	I	Follows these movements visually. She reaches forward for the block that the mother has just placed on the floor as		III_4	gf	✓

No.	M/I	AGE 00:42:00 STAGE V Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
6	M	Holds out, with her left hand, a little toy car towards Kerryn. Looking at Kerryn.	M_n	III_3	s	✓
7	I	Leaves the block on the floor and takes the car from the mother with her left hand. Puts it down, looks over from the mother's hand towards the box of toys, into which the mother is rummaging and as -	M_n	III_4	$gs//_{gf}$	✓
8	M	Places three blocks, one on top of each other, looking at what she is doing -	M_n	III_{15}	g	✓
9	I	Follows these movements visually. She then stretches forward and again with her left hand takes the top block that the mother has just placed.		P	gf	✓
10	M	Watching her. The tower falls over.		P	s	✓
11	I	Looks up at her mother as -		P	s	✓
12	M	Picks up the toy car with the left hand and holds it out towards Kerryn. Smiling, she says, "Here you are".	M_{nn}	I_3	Wg//s+	✓
13	I	Vocalizes, glances up at the mother's face and back at the car, and stretches forward with her left hand and takes it. She drops the object, looks back at the mother's hand as	M_n	P_4	$Vs//_{gs}$	✓

No.	M/I	AGE 00:42:00 STAGE V Description	mm/mnn	P,I,II III	Coded Beh.	Approp.
14	M	Picks up a block which she holds out towards Kerryn. She again says "Here you are".	M_{nn}	I_3	Ws	✓
15	I	Vocalizes. Bangs at the block in the mother's hand with the block that she is holding in her right hand and then stretches forward with her left hand and takes it. She looks up at her mother and immediately puts the block into her mouth.	M_n	P_4	$Vgs//_s$	✓
16	M	Says "Clever girl". Then holds out another block, smiling at Kerryn.	M_{nn}	I_{17} III_3	Ws+	✓
17	I	Looks from mother's face towards the block. She doesn't take it.		P	$s//_{gs}$	✓
18	M	Begins to build another block tower in front of Kerryn. Glances at Kerryn.	M_n	III_{15}	$g//_s//_g$	✓
19	I	Watching carefully.		P	gf	✓
20	M	Puts three blocks on top of one another and then holds the fourth block out towards Kerryn for Kerryn to take.	M_n	$III_{3,15}$	$g//_s$	✓
21	I	Drops the block in her left hand and knocks half the tower over, while		P	g	✓
22	M	Continues to hold the block out in front of her. Then places the block she was holding on top of the tower.		$III_{3,15}$	$s//_g$	✓

No.	M/I	AGE 00:42:00 STAGE V Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
23	I	Picks up a block off the floor, drops the block in her right hand, and again knocks over the tower.		P	g	✓
24	M	Is looking inside the cones that are lying on the floor for the squash ball.				
25	I	Follows her movements accurately.		P	gf	✓
26	M	Then knocks the ball out of the cone and holds it out towards Kerryn with her left hand. "here you are, herewha - "	M_{nn}	I_3	Ws	✓
27	I	Reaches towards it with her left hand, in which she still has a block, knocks the ball with the block. Puts the block down, smiling, and takes the ball from the mother. It immediately goes into her mouth. She then drops the block in her right hand and holds the squash ball in both hands at her mouth.	M_n	III_4	$g//_s^+$	✓
28	M	Builds another tower.	M_n	III_{15}	g	✓
29	I	Following her movements visually. Leans forward and retrieves the block that the mother has just placed. Picks it up with her left hand and places it in her mouth. She has the squash ball in her right hand. She glances up towards the mother.		P	$g//_s$	✓

No.	M/I	AGE 00:42:00 STAGE V Description	mn/mnn	P,I,II III	Coded Beh.	Approp.
30	M	Hands another block to her with her left hand.	M_n	III_3	s	✓
31	I	Looks from the mother's face to the block. Stretches towards it with the squash ball and bangs it a few times with the squash ball, but does not take it.		P	$s//_g$	✓
32	M	Then places a block onto the tower that she is building. Offers one to Kerryn.	M_n	$III_{15,3}$	$g//_s$	✓
33	I	Again knocks it with the squash ball and then puts the squash ball into her mouth.		P	g	✓
34	M	Builds another tower in front of her, talking softly to Kerryn.	M_{nn}	III_{15}	$Vg//_s$	✓
35	I	Looking at her face then back at the tower she is building.		P	$s//_{gf}$	✓

The following episode provides an excellent example of giving and taking behaviour. It is this which predominated over specific actions on or demonstrations of objects. This type of interaction facilitates the acquisition of reciprocal turn taking and of alternating roles: both essential features of communication.

Kerryn responded appropriately both to the mother handing objects to her (elements 6, 14, 20, 30, 34, 38, 40, 46) and to the mother's conventional 'hand out palm up' requests for objects (elements 26, 32, 36, 48).

Within this short episode it was evident that new behaviours were being acquired by Kerryn. In element 2 her attempt to take the block from

the mother was unsuccessful. In elements 6 and 8 her skill had improved but was not yet perfect. Elements 11-15 and 17-21 show the scaffolding, afforded by the mother, towards acquiring the skill of accurate taking of an object. From element 31, Kerryn's acceptances of offered blocks were skilled and successful.

There was very little vocalization or verbalization during this episode. The mother made frequent use of the conventional gestures for both giving (elements 1, 5, 11, 17, 29, 33, 37, 39, 41, 45) and for asking (elements 25, 31, 35, 43, 47) for objects.

AGE 00:48:00 STAGE V			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
1	M	Mother and Kerryn sitting on floor. Holding out block in front of Kerryn at eye level, looking at Kerryn.						$\overset{\blacktriangle}{3}_s$	C	3		
2	I	Right hand outstretched towards block (fist closed). Stretches out right hand - by-passes block. Smiles, continues fixation, waves right arm up and down, leans back slightly and knocks block from mother's hand.	$\bar{6}$ +gs	R	4							
3	M	Keeps hand out momentarily and then withdraws it.								P		
4	I	Drops gaze to floor and reaches for block on floor. Vocalizes.	$V2_g$		P							
5	M	Extends hand with block between left thumb and index finger, looking at Kerryn.						$\overset{\blacktriangle}{3}s$	C	3		
6	I	Fixates on block being offered and reaches for it. Right index finger and thumb in grasp around block.	6gs	R	4							
7	M	Retains hold on block, i.e. both holding it at same time. Looking at Kerryn. "Ta". Releases block.						V2 s	H	16	17	
8	I	Lifts arm and hand - block falls. Lifts eyes from block to mother's face then down to block on floor.	$2g//_s//_g$		P							
9	M	Withdraws hand, looks from Kerryn to the floor.						$Os//_g$		P		
10	I	Turns slightly, looking at block on floor. Right hand outstretched fingers extended palm downwards, leans forward and places hand on block on floor	2g		P							

AGE 00:48:00 STAGE V			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
11	M	as Extends left hand with another block towards Kerryn, looking at her.						$\overset{\Delta}{3}s$	C	3		
12	I	Still holding block on floor lifts gaze to mother's face and then to offered block. Sits back slightly, retains fixation on offered block, brings up right hand and palmar grasps block.	$6_{s//gs}$	R	4							
13	M	Thrusts it into Kerryn's palm. "There you are" - looking at Kerryn.						$\overrightarrow{W1}_s$	H	16		18
14	I	Takes the block in her right hand looking at it and vocalizes, glances at mother.	$V6g//_s$	R	4							
15	M	Withdraws hand, looking at Kerryn.						O_s		P		
16	I	Looks down at floor and then drops block onto floor. Immediately picks up a block lying next to dropped block bending over towards task, gaze intent. Lifts a block then drops it on top of another block. Picks up a block and lifts head and gazes towards mother. Swiftly raises arm and block towards mother - retains gaze on mother. Holds block at arms length and as the block begins to fall changes gaze to block and hand. Block falls. Gaze drops to block, and arm follows.	$2g//_{s//g}$		P							
17	M	Leans forward to retrieve block. Looks from block to Kerryn. Picks it up and offers it.						$\overset{\Delta}{3}g//_s$	C	3		
18	I	Looks at offered block and reaches for it.	$\bar{6}$ gs	R	4							
19	M	Again thrusts block into palm. Looking at Kerryn.						$\overrightarrow{1}_s$	H	16		
20	I	Takes block and waves arm upwards. Gaze drops to floor before taking block.	$6\ gs//_g$	R	4							
21	M	Withdraws hand and withdraws to chair. Watching Kerryn.						$\overline{12}_s$		P		
22	I	Plays with blocks, glancing at mother. Vocalizes. Picks up a block and crawls over to mother.	$V\overline{12}g//_s$		P							
23	M	Sitting in chair - drops left hand to assist Kerryn. Looking at Kerryn.						$\overline{11}_s$	R	16		
24	I	Pulling herself up against mother's knees, turns towards mother, looks at mother.	11s		P							

AGE 00:48:00 STAGE V			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
25	M	Extends hand, palm up, looking at Kerryn.						3s	C	1		
26	I	Places block accurately in palm, looking at mother's hand.	!gs	R	12							
27	M	Withdraws hand and transfers block to right hand.						2g	R	4		
28	I	Follows movements with eyes.	Ogf		P							
29	I	(Still kneeling on floor, left hand on mother's knee.) Fixates block, mouth open, reaches for it with right hand. Places right hand on mother's knee and pulls herself upright. Reaches for block and takes it successfully. Smiles and turns to look at mother.	6gs//s+	R	4							
30	M	Immediately extends hand, palm up, looking at Kerryn.						3s	C	1		
31	I	Places block on mother's palm - withdraws hand and pats block, knocking it into mother's left hand.	!gs	R	12							
32	M	Withdraws left hand with block, looking at Kerryn. Transfers it to the right hand and offers block to Kerryn.						▲3s	C	4,3		
33	I	Looking at mother's hand, reaches for block and takes it.	6gs	R	4							
34	M	Immediately places hand palm up looking at Kerryn.						3s	C	1		
35	I	Places block in palm then lifts it and bangs it down - block rolls onto mother's knee.	!gs	R	12							
36	M	Retrieves block with left hand, transfers to right hand, offers to Kerryn.						▲3s	C	4,3		
37	I	Leans back slightly, broad smile, extends left hand to block, takes it and throws it into mother's lap, then stretches for it.	6+s	R	4							
38	M	Leans back and then retrieves block and offers it to Kerryn with left hand while right hand remains palm up. Glances from block to Kerryn.						▲3g//s	C	3		
39	I	Takes block and leans to place it on mother's left hand - ignoring the outstretched right hand. Plays with block on mother's lap.	6gs	R	4							
40	M	Takes block from left palm and offers it to Kerryn with her right hand, looking at Kerryn.						▲3s	C	3		

AGE 00:48:00		STAGE V	Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
41	I	Fixates, takes block and again drops it into palm of mother's left hand.	6gs	R	4,3							
42	M	Keeps right palm up, looking at Kerryn						3s	C	1		
43	I	Picks up block, drops it onto lap, again does this, plays with block on mother's knee.	2g		P							
44	M	Picks up block with right hand, offers to Kerryn, looking at her.						▲ 3s	C	3		
45	I	Turns to gaze at block - takes it with left hand - lifts arm.	6gs	R	4							
46	M	Thrusts right palm out, looking at Kerryn.						3s	C	1		
47	I	Bangs block onto palm - block falls onto floor.	1g	R	3,12							
48	M	Moves hand away, looks down.										
49	I	Retains gaze on hand. Looks around and then turns to look at floor - bends down to retrieve block - crawls off.										

12.1.2.2 Stage VI.

In this next episode (01:04:00) the behaviour was characteristic of early stage VI functioning. Kerryn's lack of motor skill and lack of motor co-ordination prevented fruitful co-operation on the task (elements 3, 5, 11, 15). It would seem that Kerryn could not yet accurately differentiate between the mother's intentions for her to *take* an object or to *do something to* an object. Thus the mother's intention in elements 4 and 14 were inappropriately responded to.

Kerryn was silent throughout this episode.

The mother used both conventional gestures (elements 2, 10, 12), demonstrations (elements 2, 8, 18) and verbal instructions (elements 2, 4, 6, 8, 14 and 18) in attempting to teach Kerryn this skilled action.

Although Kerryn did not initiate any communicative actions requiring

specific responses, her reactions were frequently appropriate and the phatic channel was maintained throughout this episode.

AGE 01:04:00 STAGE VI			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
1	I	Sitting on the floor in front of the ring toy surrounded by toys, playing with the rings from the ring toy.										
2	M	Moves forward off the chair, saying as she moves forward: "Put it back". Left hand outstretched towards Kerryn, looking at Kerryn. Crouches over in front of the ring toy and says again: "Put it back". She taps the top of the peg. She says: "Put it on top of this". "On here", as she withdraws her hand. Alternates her gaze between peg and Kerryn.						W3s W3g//s	C H	8,15		11 11
3	I	Follows mother's movements visually. Left hand comes across with the ring in it but she doesn't lift it up high enough and bangs the side of the peg with it, looking at the toy. Left hand drops towards the floor, still holding the ring.	2gf//g	R	12							
4	M	Moves the peg over in front of the ring held by Kerryn and says: "Put it on top here", as she places the peg on the ground, holding the peg. Mother's gaze intent on Kerryn.						W2s	H	8,15 16		11
5	I	Fixating the peg. Drops the ring and picks up the peg toy by the top of the peg.	2g		P							
6	M	Retrieves the ring and stretches forward her right hand to take the peg from Kerryn as she says: "Like this - look, let Mommy show you", looking at Kerryn then at the toy.						Ws//g	H	15		15
7	I	Lets go of the peg and visually follows mother's movements.	Ogf	R	12							
8	M	Places the first ring and then stretches over and retrieves second ring, places it with a very definite movement and then retrieves the third ring. Holds it out towards Kerryn with her right hand extended towards Kerryn and says: "Put it on".						W3s	H	3,15		11
9	I	Immediately stretches forward her left hand to take the ring.	6g	R	4							

AGE 01:04:00 STAGE VI			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
10	M	As mother withdraws her hand she taps the top of the peg, looking at Kerryn.						$\vec{3}_s$	H	8,15		
11	I	Left hand comes across with the ring but again she doesn't place it on top of the peg but bangs it against the base of the peg.	2g	R	12							
12	M	Stretches forward with her right hand and holds the top of the ring between her finger and thumb. Points to the top of the peg with her right index finger.						$\vec{3}_s$	H	8,16 15		
13	I	Still looking down at the base of the peg and manipulating the ring at the base of the peg.	2g		P							
14	M	Holds the top of the peg to prevent it from swinging around as Kerryn bangs her ring backwards and forwards, she says: "Put it on the top".						$W2_s$	H	16		14
15	I	Drops the ring and picks up the ring toy by the peg.	2g		P							
16	M	Immediately stretches forward right hand to retrieve the ring.						2g		P		
17	I	Gaze following the mother's movements. Picks up the peg toy with two rings on it, eye level, glances at mother	$2gf//_s$		P							
18	M	as Stretches forward left hand to take the peg toy from her. Takes the ring toy from Kerryn, places it firmly on the ground, as she says: "Let Mommy show you". Placing the ring over the top of the peg with the right hand, looks up at Kerryn.						$W2g//_s$	H	15		18
19	I	Fixating mother's movements.	Ogf		P							
20	M	Withdraws hand after placing the ring and sits back watching Kerryn.						$\overline{12}_s$		P		
21	I	Plays with the ring toy, glancing occasionally at mother and vocalizing occasionally.										

Behaviour in this next episode showed no qualitative changes over the previous episode. There was, in embryonic form, co-operative activity on a joint task: however it is still better categorized as stage VI behaviour as Kerryn's actions were in response to specific instructions, for example asking for a ring (elements 2, 4, 10, 12, 20, 34), offering a ring or the peg (elements 22, 24, 26, 38, 48), or pointing to and

asking for a ring some distance from Kerryn (elements 18, 28, 34, 50). The only point which Kerryn responded to was the last one (elements 50, 51). This response was not entirely appropriate. She did turn, after looking at the mother's outstretched hand, towards the direction being indicated. However, after moving in this direction she turned and wandered off to the other side of the room.

The attempted extension of their joint attention beyond objects in the immediate vicinity is of interest: this ability would greatly expand the limits of their interaction. It is obvious that when this does occur there will be an increasing dependence on language and deictic gestures to differentiate objects in the environment that cannot be immediately acted upon.

There was one example in this episode of the mother inferring a non-natural meaning (elements 21, 22). Kerryn's actions continued to be predominantly reciprocal in nature, however there was one communicative action categorized as Conative (element 21) and a number placed in the Unclassifiable category (elements 13, 15, 19, 23, 25). This indicated that she was becoming a more active participant in their interactions.

AGE 01:06:00 STAGE VI			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
1	I	Sitting on floor holding ring up with right hand, grasps it with left hand, lowers it and vocalizes.										
2	M	Sitting opposite her with right hand extended says, "Bring it to Mommy", right hand extended in conventional gesture, looking at Kerryn.						W3s	C	1		1
3	I	Leans forward on her left hand, right hand outstretched, looking up at the mother.	$\overset{\blacktriangle}{3}_s$	R	3,12							
4	M	Right hand out and says, "Bring to Mommy", looking at infant.						W3s	C	1		1
5	I	Places the toy in the mother's palm, looking at mother.	$\underline{1}_s$	R	12							
6	M	Fingers immediately close on the ring. As she says "Thank you" -						$W6_s$	R	4	20	

AGE 01:06:00		STAGE VI	Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
7	I	Withdraws suddenly, sitting back, holding the ring. Sits down and stretches forward with her left hand to a toy on the ground.										
8	M	Puts her hand out and says: "Please", looking at Kerryn.						W3s	C	1		1
9	I	Picks up the peg from the ring toy and places it in front of her on the floor, glances from the mother's hand to the toy.	$2gs//_{g}$		P							
10	M	Stretches her hand out again with an emphasized gesture and says: "Just one" (difficult to hear), looking at Kerryn.						W3s	C	1		1
11	I	Looks from the mother's hand down to the peg of the ring toy. Picks up the peg with her left hand and holds it towards the mother's right hand. Places it in the mother's palm.	$\underline{1}gs//_{g}//_{s}$									
12	M	Immediately mother's fingers close around the base of the peg toy.						6g	R	4		
13	I	Does not let go - looking at the ring toy.	2g	U	?13							
14	M	Pulls the peg toy away from her and says "Thank you", looking at Kerryn.						$W6_{s}$	C	2	17	
15	I	Vocalizes, starts crawling towards the mother, looking at the mother.	$V12_{s}$	U	?2, 21							
16	M	Places the peg of the ring toy on the floor in front of her. Looks from the toy to Kerryn.						$1g//_{s}$	C	3		
17	I	Crawls towards it, the ring in her right hand and places the ring on top of the peg.	2g	R	12							
18	M	Takes the peg with her left hand, pointing with her right hand past Kerryn's shoulder towards another ring. "Go and bring another one."						W3→	C	8		1
19	I	Crawls towards the mother, stretches out with her right hand to the ring toy which mother is still holding with her left hand. Fixating on the ring toy.	8g	U	?1							
20	M	Using her right hand to prevent Kerryn from getting the ring toy as she says: "Go and bring another one". Looks up towards the ring indicated as she says "There, another one", moving the ring toy out of Kerryn's reach with her left hand, keeping Kerryn from it with her right hand.						$W2_{gp}$	C	8		1

AGE 01:06:00 STAGE VI			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
21	I	Reaches forward towards the ring toy and gives a cross cry standing up in front of the mother.	V8g	C	2							
22	M	Looks at Kerryn's face, holding ring toy out with her left hand and says "Are you cross?"						W3s	C	3		26
23	I	Another little whine, looking at the ring toy.	VOg	U	↑1, 7,21							
24	M	Says: "Here you are then", holding the ring toy out in front of Kerryn.						W3s	C	3		3
25	I	Another little cry.	VOg	U	↑1, 21							
26	M	Transfers the ring toy to her right hand holding it in front of Kerryn just underneath Kerryn's right hand.						3s	C	3		
27	I	Steps back, fixates the ring toy.	$\overline{12}$gs		P							
28	M	Points rapidly with her left hand looking at Kerryn's right hand as she takes the ring toy and says, "Go and bring another one", and rapidly taps the top of the ring toy and says: "Put it on here". Looks from ring to Kerryn.						3gp//s	C	8,15		1,14
29	I	Grasps the peg of the ring toy with her right hand.	2g		P							
30	M	Still holding the base with her right hand.						2g		P		
31	I	Takes the ring toy.	2g		P							
32	M	Drops her hand, looking at infant.						5s		P		
33	I	Holds it up in front of her, holding it with both hands in the midline and looks at it intently.	2g		P							
34	M	Points rapidly with her left hand and says: "Go and bring another one". Another rapid point as she says: "Go and bring another one".						W3	C	8		1
35	I	Turns back towards the mother, looking up at her, holding the ring toy by the peg in her left hand and the ring on the toy in her right hand.	2s		P							
36	M	Bends down to look intently at Kerryn's face.						Os		P		
37	I	Holds the toy up by the ring and the peg slips out from the ring and falls to the floor.	2s		P							
38	M	Immediately retrieves it with her right hand and holds it out to Kerryn, looking at Kerryn.						3s	C	3		
39	I	Takes peg in her left hand and looks down from the mother's hand to the peg which she is holding.	6gs//g	R	4							

AGE 01:06:00 STAGE VI			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
40	M	Immediately drops her right hand.						5s		P		
41	I	Attempts to place the ring with her right hand over the top of the peg.	2g	R	12							
42	M	Watching intently.						Os		P		
43	I	She gets the ring over the top.	2g	R	12							
44	M	Says: "Clever girl!"						WOs	E			17,20
45	I	Then grasps the ring with her left hand and the peg slips out.	2g		P							
46	M	Hand immediately comes forward as if to grab the peg before it falls. Both looking at the peg as it falls. Falls to the floor.						2g	R	16		
47	I	Looks down at it.	Og		P							
48	M	Retrieves it with her left hand and transfers it to the right hand and holds it out to Kerryn.						A 3s	C	3		
49	I	Takes it with her right hand. As she grasps it -	6g	R	4							
50	M	Again points and says: "Go and bring another one".						W3 →	C	8		
51	I	Pulls the peg away from her looking down at the mother's pointing finger and then towards the direction of the point. She throws the ring toy away and turns and starts walking towards the direction indicated by the mother. Vocalizes and moves away from the mother.	V12 gp		27							

The beginning of co-operative activity towards the completion of a shared goal was apparent at 01:10:00. The mother continued to structure the situation, passing objects and supporting Kerryn as she perfected the skills required for successful action on the toy with which they were playing. The majority of Kerryn's reactions to the Conative or Heuristic communicative acts initiated by the mother were appropriate. She did not initiate communicative acts which required specific responses. (Some of the Unclassifiable actions of Kerryn may be precursors of Conative actions). Kerryn placed a ring in position on the peg on five occasions (elements 21, 23, 25, 31, 33), each one of these was accompanied by a vocalization. Again these vocalizations did not follow a consistent phonetic form but their utterance coincided with the placing of the rings, not with taking them from the mother. This

combination of sound + placing a ring did not persist. Regularities between sounds and actions are important for the appearance of speech and although this particular regularity in Kerryn's behaviour did not persist one could perhaps infer that this co-ordination of sound + action was a precursor of conventional gestures + vocalizations which appeared later in development.

This episode was still consistent with stage VI functioning.

AGE 01:10:00 STAGE VI			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
1	I	Sitting on the floor in front of mother looking at the floor.										
2	M	Left hand outstretched towards a ring from the ring toy looking at the ring.										
3	I	Retrieves ring with right hand and begins to stand up leaning on her left hand.										
4	M	Extends left hand with ring in it towards Kerryn, held in front of Kerryn's face.						$\overset{\Delta}{3}_s$	C	3		
5	I	Places ring held in the right hand on top of the offered ring and tries to take hold of both of them. Withdraws, stands up, still holding one ring.	$\bar{6}gs$	R	4							
6	M	Still has her left hand outstretched with the offered ring held between her thumb and index finger, looking at infant.						$\overset{\Delta}{3}s$	C	3		
7	I	Takes the ring with her left hand looking past the mother and starts to walk in that direction.	6g	R	4,8							
8	M	Glances down at the floor in the direction to which Kerryn is walking.						Ogp		P		
9	I	Looks over her left shoulder towards mother. She turns and looks behind her.	$Os//_E$	U								
10	M	Quickly scans the room and says: "What are you looking for?"						WO_E	C			24
11	I	Turns round again and looks in front of her.	O_E	U								
12	M	Looks down at same position on the floor in front of Kerryn and goes "Hmmm?"						VO_{gp}	C	24		

AGE 01:10:00 STAGE VI			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
13	I	Crouches down - she's now on the mother's left hand side - and fiddles with some objects on the floor. Places the ring in her left hand onto the floor and continues to scan the floor in front of her.										
14	M	Extends her left hand, touches Kerryn on the left shoulder and says: "What is it?" as she extends her right hand in a point and says: "There, there, look". As she reaches forward with the right hand to retrieve the peg -						W11s W3g	C C	19 8		24 8
15	I	Turns towards the mother's right hand and gives a short, sharp vocalization as she sits back.	VOgs	U	?1, 7,10							
16	M	Places the peg toy in front of Kerryn and says: "That's what you're looking for", looking at Kerryn.						W1s	C	3		7
17	I	Extends her right hand with the ring towards the peg as -	Δ 3g	U								
18	M	Moves the peg with her right hand a few feet in front of Kerryn and says: "We'll put it here". She then leans forward, taking Kerryn under the arms and says: "Come and sit here", as she picks Kerryn up and places her on the other side of the peg now facing the camera.						W2g W12	C	3,11		18 10
19	I	Is still clutching the ring in her right hand and looking at the peg.	2g		P							
20	M	As she withdraws after placing Kerryn she says: "There you are".						W5s	C	10		26
21	I	Immediately extends her right hand and accurately places the ring over the top of the peg. As she bangs the ring down towards the base she makes a guttural exhalation sound and withdraws her right hand looking over past the mother towards the pile of rings.	V2g¹//g²									
22	M	Responds "Clever girl" and looks over her shoulder in the same direction as Kerryn's gaze. She says, "Look here". Holds up the ring in her right hand towards Kerryn.						Δ W3gp//s	C	3		20, 10

AGE 01:10:00 STAGE VI			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
23	I	Immediately stretches forward her right hand to retrieve the ring which she takes. Places the second over the top of the peg accurately and rapidly with the same guttural vocalization as the action is completed. Withdraws her hand looking at the peg.	V6g	R	4,12							
24	M	Retrieves the third ring with a "There you are", holding the ring out towards Kerryn with her hand in the same position.						$\overset{\Delta}{W3}_s$	C	3		3
25	I	Again extends her right hand looking at the ring in the mother's hand. She takes the ring and her gaze moves immediately to the top of the peg. Places the ring on top of the peg with the same vocalization as accompanied the two previous actions.	V6gs//g	R	4,12							
26	M	Watching Kerryn - "Clever girl" (the third ring placed was the wrong size). "This one comes first", looking over towards a ring on the floor.						WOs//g	H	8		20,7
27	I	Stretches forward her right hand, takes the peg toy by the top of the peg and moves the toy over towards her right hand side, her gaze fixated on the floor in front of her.	2g		P							
28	M	Stretches forward her right hand, pulls the peg toy out of Kerryn's grasp to the position in front of Kerryn and removes the top ring, the incorrectly placed ring, as she says: "This one, then this". Rapidly placing a ring with her left hand and then replacing the top, incorrectly placed ring. Looks at Kerryn.						W2g//s	H	15		7
29	I	Sitting back watching the procedure.	Ogf		P							
30	M	Then rapidly retrieves a ring with her right hand, holds it out in front of Kerryn and says: "This one", looking intently at Kerryn.						$\overset{\Delta}{W3}_s$	C	3		8,14
31	I	Looking at the mother's hand, right hand moves out immediately to take the ring. She takes the ring. Places the ring on top of the peg. As she completes the action she vocalizes.	V6gs//g	R	4,12							
32	M	Immediately holds out another ring with her right hand saying: "There you are".						$\overset{\Delta}{W3}$	C	3		3

AGE 01:10:00 STAGE VI			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
33	I	Stretches forward her right hand to take the ring, looking at the ring. She places it on top of the peg accurately, and vocalizes.	V6g	R	4,12							
34	M	Says: "That's a clever girl, hey", looking at Kerryn.						WOs	E			20, 26
35	I	Looking intently at the peg toy. Stretches forward her right hand to the top ring on the peg. She fiddles with the top of the peg, scanning the room.	2g//E	U	?1, 10							
36	M	Stretches out with her left hand and says: " ... is it" (indistinct). She retrieves a ring from the floor with her left hand, passes it into her right hand, looks from object to Kerryn.						W2g//s	U			
37	I	Withdraws her hand from the top of the peg, looking intently at the mother's hand.	Ogs		P							
38	M	Stretches forward with the knob in her right hand and emphatically places it on top of the peg with a slapping down movement.						2g	H	15		
39	I	Watches intently. Extends her right hand onto the knob of the ring toy, vocalizes as she grabs the knob. She lifts the knob off the top of the peg and again vocalizes looking at the peg.	V2gf//g	R	12							
40	M	Watches Kerryn and then gets up and and moves away.						12s//	T			

Behaviour at 01:12:00 remained consistent with stage VI behaviour.

Kerryn initiated communicative acts requiring specific reactions from the mother (elements 17, 21) and, throughout this episode, responded appropriately to the mother's communicative actions. In element 15 she positioned the doll in the conventional maternal care position and patted it. This indicated that there was a degree of reciprocal assimilation between the cognitive schemes of "the way mother behaves to a baby" and "the way Kerryn behaves to a baby", i.e. a relationship

between mother and self. The mother's response of imitation and extension of the action scheme with appropriate verbalizations could be seen as positively reinforcing. There were no situations in this episode which were consistently accompanied by vocalizations, nor were the vocalizations which did occur phonetically consistent. In elements 4 and 5 Kerryns' response to the mother's point was slightly advanced over the previous episode in that she did not fixate the mother's hand but did glance or move in the direction of the point. The mother changed the function of her communicative action from one of indicating an object to one of asking for an object, which confused the issue.

Kerryn did not attempt to reproduce the crying of the doll herself. On each occasion she returned the doll to the mother for a repetition of the cry. This may have indicated that Kerryn's cognitive scheme for this was mother+doll+cry, not that the cry was a property of the doll which could be elicited by anyone.

She did, in later episodes, manipulate the doll to elicit the cry.

The quality of the interaction in this episode is approaching stage VII behaviour which appeared for the first time at 01:17:00.

AGE 01:12:00 STAGE VI			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
1	I	Standing in front of the mother, bends down to pick up the driver from the cement mixer.										
2	M	Sitting in the corner looking at Kerryn.										
3	I	Turns and glances at the mother with the driver in her right hand, then turns back and bends down and picks out the second driver with her left hand. She vocalizes softly and walks towards the mother.	V2s//g	U	?3, 7,10							
4	M	Looking at Kerryn says: "Clever", and then stretches out her left hand pointing the index finger but still looking at Kerryn and says: "Go and put it here".						W3s	C	8	20	10

AGE 01:12:00 STAGE VI			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
5	I	Turns slightly towards the direction of the mother's point, scans the room.	$O_{gp//E}$	R	12							
6	M	Then extends her right hand, palm upwards in a conventional gesture in front of Kerryn: "Give it to Mommy".						W3s	C	1		1
7	I	Looks down at mother's hand and then brings up her right hand with the driver and holds her hand briefly over the mother's hand and then withdraws her hand and sits down on the floor still holding the two drivers.	▲ 3s	R	12//5							
8	M	Slowly withdraws her hand. Looking at Kerryn.						5s	U			
9	I	Kerryn glances at the mother's hand and then brings both the drivers into the midline and looks at them.	$2gs//_{g}$		P							
10	M	Stretches out with her left hand towards the squeaky doll on her left and picks it up. As she brings it towards Kerryn she says: "Look at this". Looking at the doll.						$W2g//_{s//g}$	C	15		10
11	I	Looking at the drivers between her legs.										
12	M	Then moves the doll backwards and forwards to get it to squeak, as she says: "Kerryn", and looks up at Kerryn.						$W2g//_{s}$	C	15	19	
13	I	Immediately looks up at the doll as it squeaks.	Ogs	R	12							
14	M	Says: "What's that?", holding the doll with her right hand towards Kerryn.						▲ W3s	C	3		7
15	I	Extends her right hand with the driver in it, puts both drivers down, brings her hands together in the midline and gives a 'delighted' vocalization. She crawls forward and reaches forward with her left hand to take the doll from the mother and vocalizes. She places the doll over her right shoulder and pats it twice.	V6g	R	4							
16	M	Extends her right hand and taps Kerryn on the bottom as she says: "oh, she's crying. Shoo-shoo".						W11s	R			7

AGE 01:12:00 STAGE VI			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
17	I	Looking down over the doll's shoulder towards the floor. Holds the doll away from her and gives a squeak, glances at mother.	▲ V3c//s	C	3,10							
18	M	Looking at Kerryn, takes the doll from her with both hands and turns the doll backwards and forwards to get it to squeak. She then holds it out again towards Kerryn.						3s	C	4,3, 15		
19	I	Gives the same 'delighted' vocalization and moves a step forward towards the doll, looking at the doll.	VOgs	R								
20	M	Looking at Kerryn with a smile, still holding out the doll.						▲ 3s+	C	3		
21	I	Takes the doll with her left hand and immediately extends her left hand with the doll to the mother.	▲ 3s	C	4,10							
22	M	Takes the doll, turns the doll upside down to get it to squeak, watching Kerryn intently.						2s	R	4,12 15		
23	I	Eyes focussed on the doll. Chuckles.	VOg+	E	20							
24	M	Demonstrates again.						2s	R	15		
25	I	Moves forward with her left hand extended towards the doll. Takes the doll from the mother and walks off with the doll under her right arm towards the cup toy.	6s//g	R	4							
26	M	Sits back watching.										

12.1.2.3 Stage VII.

This episode (01:17:00) was the first observed occasion on which books were constructively utilized by Kerryn. Prior to this she treated books as objects similar to toy trains, cars, etc., not objects which represented other objects in the real world. Objects which should be looked at rather than acted on.

There was evidence of the emergence of co-operative activity focussed on an object. For example, either partner turning the pages (elements 3, 7, 13, 16, 20) or indicating objects to be identified (elements 6, 11,

16, 17), or identifying objects (elements 2, 5, 9, 10, 12, 14, 20, 23, 25). For this reason it was regarded as a transition into stage VII. On three occasions Kerryn vocalized with a consistent phonemic structure and intonation. The vocable used was "Judy" (which is the name of the family dog) and this was used accompanying a point in labelling certain pictures in the book, many of them appropriately (elements 5, 23, 25). Her use of two conventional gestures, pointing to objects and handing objects, was clearly evident.

This episode was more 'conversational' in nature with both partners initiating communicative actions, responding appropriately and maintaining the interaction with each other structured around the book. These actions on objects served to maintain the phatic channel even when eye contact or vocalizations were absent. From this point of development vocalizations with specific phonemic patterns became increasingly important. Conventional sound patterns differentiated actions which, prior to the infant taking such an active part in the interaction, had only one meaning. For example, holding an object out towards the partner can mean:

1. What is this?
2. Here you are - take it from me.
3. How does this work?
4. Where does this go? etc.

Previously, when giving and taking objects predominated in the interactions between mother and infant the second of these possibilities was almost without exception the illocutionary force of the communicative action. To enable increasingly complex constructive co-operative activity on the world, some means of differentiating between the possible forces of communicative actions is necessary. The context in which the interaction takes place is, on its own, inadequate to disambiguate the action. The behaviour which appears now and becomes increasingly important in giving the meanings to communicative acts is that of differentiated and consistent sound patterns which emerge as parts of specific action patterns. These represent the emergence of $meaning_{nn}$ in sound patterns. Eventually these sound patterns (vocables and morphemes) will become

sufficient to convey the force of the action without associated gestures.

Unfortunately, as has already been stated, the quality of the sound record precluded a phonetic analysis of the infants' vocalizations[1].

AGE 01:17:00 STAGE VII			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
1	I	Crouching on floor in front of the mother who is sitting in the chair. Reaches forward with her left hand and turns a book over.										
2	M	Leaning forward with her right hand on the floor in front of the book being handled by Kerryn. Leans forward and points with her index finger to a picture on the cover of the book and says: "There's Teddy". Glances from the book to Kerryn. Withdraws her hand.						W3→g//s	C	8		6
3	I	Changes from the crouch position and sits down flat on the floor as she begins to open the book with her left hand. She gets the book open as	2g	R	12							
4	M	Leans forward with her left hand to assist her to get the book into position.						2	R	16		
5	I	Vocalizing: "Judy", looking at the book.	VOg	R		6						
6	M	Points momentarily with her right index finger to a picture on the right hand side of the page, then she moves the book over to a better position for Kerryn to see and says: "Where's Judy?"						W3→g	C	8		24
7	I	Reaches forward with her left hand and begins to turn the page.	2g		P							
8	M	Leans further over and with her right hand assists Kerryn.						2g	R	16		
9	I	Points with her left index finger at a picture on the page and vocalizes.	V3→g	R	8							

[1] The improved recording facilities now available in the Developmental Laboratory provide a sound record of sufficient quality to follow this developmental sequence. It is intended to pursue this.

AGE 01:17:00 STAGE VII			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
10	M	Extends her right index finger to a picture just below the one that Kerryn is pointing at and says: "There's Judy".						$W\vec{3}_g$	H	8		8
11	I	Drags her hand down and vocalizes again. Leaves her finger on the picture.	$V3_g$	R	8,12							
12	M	Verbalizes, saying: "Yes, there's Judy".						WO_g	R			6,8
13	I	Stretches over with her left hand to get the far corner of the page to turn back a page.	2g		P							
14	M	Points to a picture on the page that Kerryn's about to turn and says: "There's a bicycle".						$\vec{3}_g$	H	8		6
15	I	Closes the book and pushes it over. Extends her arm with the book in it and puts it down some distance from her and leans forward to retrieve another book from the pile in front of the mother. As she does this -	2g		P							
16	M	Leans forward with her right hand to place the book in front of Kerryn. Opens the book in front of Kerryn and points to a picture on the right hand page with her right index finger. Glances from the book to Kerryn.						$\vec{3}_{s//s}$	C	8		
17	I	Immediately leans over and points to the same picture with her right index finger. Then gets up, picks up the book, and moves a slight distance away from the mother and turns around and holds the book out to the mother with her right hand, as she vocalizes sharply, holding the book up to the mother.	$\vec{3}g$ $\hat{V3}_s$	R C	12,8 3							
18	M	Takes the book, says: "Thank you", looking at Kerryn, smiling.						$W6_{s+}$	R	4,20	17	
19	I	Moves over, stands next to the mother, extends her left hand towards the book, looking at it.	3g	C	10							
20	M	Tilts the book so that Kerryn can see it, as she says: "Do you want to see?" She points rapidly to a picture on the cover and says: "See there's a teddy", as she begins to open the book.						$W\vec{3}g$	H	8		6
21	I	Makes a slight vocalization as the first page is opened.	VOg		P							

AGE 01:17:00 STAGE VII			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
22	M	Holds the book open towards Kerryn, looking at Kerryn and says: "Who's that?"					\	W2s	C			24
23	I	Points with her right index finger at a picture on the page being displayed by mother and vocalizes: "Judy", looking at the book.	V3g	R	8	6						
24	M	Still looking at Kerryn, repeats: "Who's that?"						WOs	C			24
25	I	Points with right index finger to a picture slightly to the right of the one she's been pointing at and vocalizes again, "Judy", looking at the book.	V3g	R	8	6						
26	M	Moves away and sits down.										

Stage VII behaviour predominated in the interaction at 01:21:00 as the following extract illustrates.

AGE 01:21:00 STAGE VII			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
1	I	Sitting on the floor next to the mother playing with the ring toy.										
2	M	Watching intently.										
3	I	Takes off one ring and puts it back. Fiddles with the ring toy in front of her, knocks the two top rings off and looks at the point where they have fallen. Vocalizes, takes off the third ring and holds it up in her left hand towards the mother; looking at the mother and vocalizes.	V3g//5	U	?3,6							
4	M	Extends her right hand, palm uppermost in a conventional gesture and smiles at Kerryn.						3s+	C	1		
5	I	Looks down at the mother's hand. She places the ring in the mother's hand.	lgs	R	3							
6	M	Takes the object, looking at Kerryn. Smiles.						6s+	R	4		

AGE 01:21:00 STAGE VII			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
7	I	Turns again towards the ring toy and vocalizes. Holds the next ring out towards the mother with her left hand, looking at her, and vocalizes again.	$\overset{\Delta}{V3s}$	C	3							
8	M	Stretches out her right hand and takes the ring, this time without the conventional gesture, looking at Kerryn. Says: "Thank you".						W6s	R	4	20	
9	I	Swings her left arm back towards the ring toy and vocalizes as she grabs hold of a ring. She holds the ring out towards the mother, vocalizing.	$\overset{\Delta}{V3g//_s}$	C	3							
10	M	Stretches forward with her right hand and takes the ring, looking at Kerryn.						6s	R	4		
11	I	Immediately looks down towards the ring toy bringing her hand back and vocalizes again. Takes off the last ring, vocalizes and holds it out towards the mother, looking at the mother with another vocalization.	$\overset{\Delta}{V3g//_s}$	C	3							
12	M	Takes it and says: "Thank you".						W6	R	4	17	
13	I	Plays with the ring toy. Vocalizes three times. Holds a ring out towards mother, looking at her, and vocalizes.	$\bar{V3}s$	C	3							
14	M	Stretches forward her right hand and takes the ring, and says "Thank you". Looking at Kerryn.						$W6_s$	R	4	17	
15	I	Returns her concentration to the peg toy and lifts the second ring off with both hands and vocalizes. Holds the ring out with her left hand towards the mother.	$\overset{\Delta}{V3g//_s}$	C	3							
16	M	Right hand immediately comes forward with the upturned palm to take the ring. Gets hold of the ring but Kerryn withdraws it.						$\bar{6}s$	R	4		
17	I	Turns her attention again to the ring toy. She places the ring on top of the peg, turns towards the mother, extends her left hand palm downwards, fingers outstretched, and vocalizes. Keeps her hand in that position.	$\bar{V3}g//_s$	U	?1, 6,10							
18	M	Holds out the ring and then withdraws it, indicating the ring toy, and says: "Put this one on first".						$\vec{W3}s$	H	8		14

AGE 01:21:00 STAGE VII			Infant					Mother				
No.	M/I	Description	C/A	F	P/III	II	I	C/A	F	P/III	II	I
19	I	Turns her attention to the ring toy, both hands over the peg. Picks up the ring toy with both hands, one on the peg and one on the base, and turns towards the mother.	2g//s		P							
20	M	Leans forward with the ring in her right hand, takes the peg toy from Kerryn, places it on the floor, takes off the one ring, holds out the bigger ring to Kerryn, who -						Δ 3g//s	C	4,3		
21	I	Takes it with her right hand, vocalizing as she does so. Places the ring and then turns towards the mother with her right hand extended and vocalizes again.	V3	C	4,1							
22	M	Offers ring, looking at Kerryn.						Δ 3s	R	3		
23	I	Takes the ring, sits back sharply and vocalizes. Places the ring with her right hand then again leans forward towards the mother with her right hand extended and vocalizes again, looking at mother.	V3g//s	C	4,3							
24	M	Offers a ring with her right hand.						Δ 3s	R	3		
25	I	Takes it. She sits back and plays with the ring toy. Vocalizes. The ring toy drops to the floor and she extends her left hand with a ring in it towards the mother and vocalizes with this gesture.	V6s//g Δ V3g//s	R U	4 ?2, 6,10							
26	M	Stretches forward to take the ring with her right hand, as she is about to take it -						$\bar{6}$	R	4		
27	I	Snatches the ring back. Puts her with the ring in it onto the floor and stretches forward with her right hand over the ring toy.	2g		P							
28	M	Stretches forward her left hand and lifts the ring toy into position, putting it down on the floor in front of Kerryn, looking at Kerryn.						1s	H	16		
29	I	Places the ring with her right hand - the wrong sized ring. Stretches forward and picks up another ring with her right hand and places it on top, then transfers the ring from her left hand to her right hand and places this on top. The rings are now incorrectly placed.	2g		P							
30	M	Watching intently.										

Many of the infant's communicative acts remained unclassifiable because there was not yet sufficient consistency in the sound patterns which accompanied them to enable a differentiation of illocutionary force from the same gesture or action. In elements 3 and 25 it was not clear whether Kerryn was offering an object to the mother or labelling the object or action. In element 17 the confusion was between requesting an object, labelling an object or action, or requesting an action of the partner. Sounds did accompany these actions; it is suggested that this stage marked a transition into primitive speech acts.

During this session both partners made frequent use of conventional communicative gestures (holding out objects, holding out the hand palm uppermost, pointing, etc.). The increasing frequency of conventional communicative gestures in the infant's communicative repertoire would facilitate communication with non-familiars because these gestures are understandable to any member of the social group. The increasing social contacts of the eighteen month old infant dictate the establishment of conventional communicative acts (including speech) to ensure that they remain successful.

For the first time, the infant's conative acts outnumbered the mother's (7:2). This indicated that there had been a shift in control of the interaction within the dyad. This reversal of control from mother to infant was not unexpected. The mothers had, from the beginning, been leading their infants towards the degree of communicative competence which made this possible. (See Figures 23 and 24.)

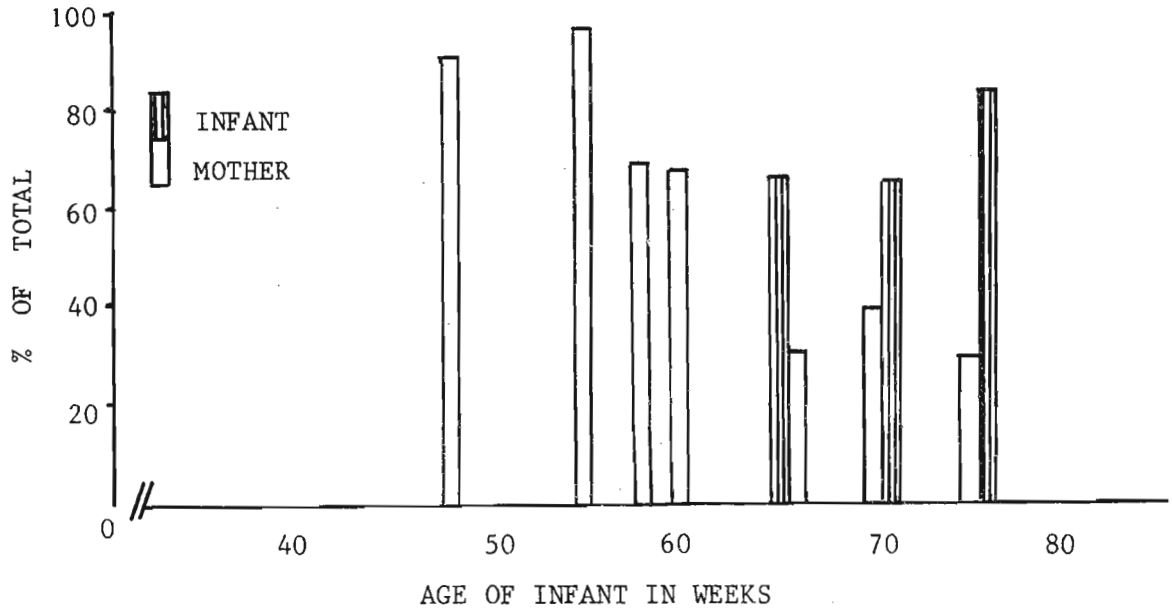


Figure 23 Percentage of Conative Plus Heuristic Functions of Total Number of Communicative Actions in Each Ten Minute Episode.

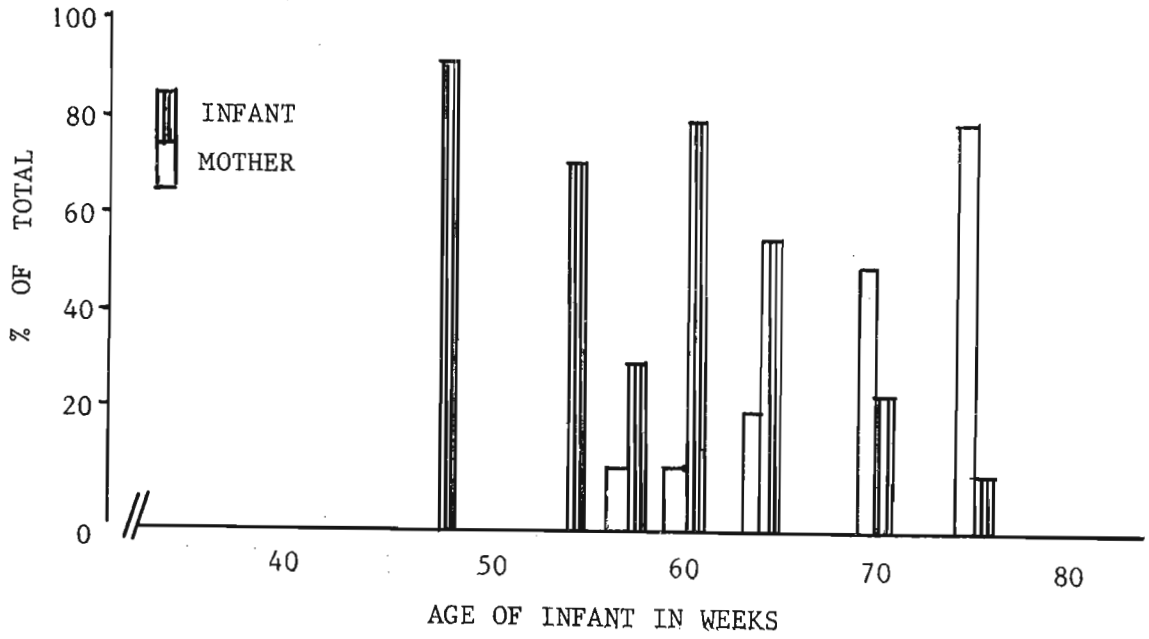


Figure 24 Percentage of Reciprocal Functions of the Total Number of Communicative Actions in Each Ten Minute Episode.

13.0 CONCLUSION.

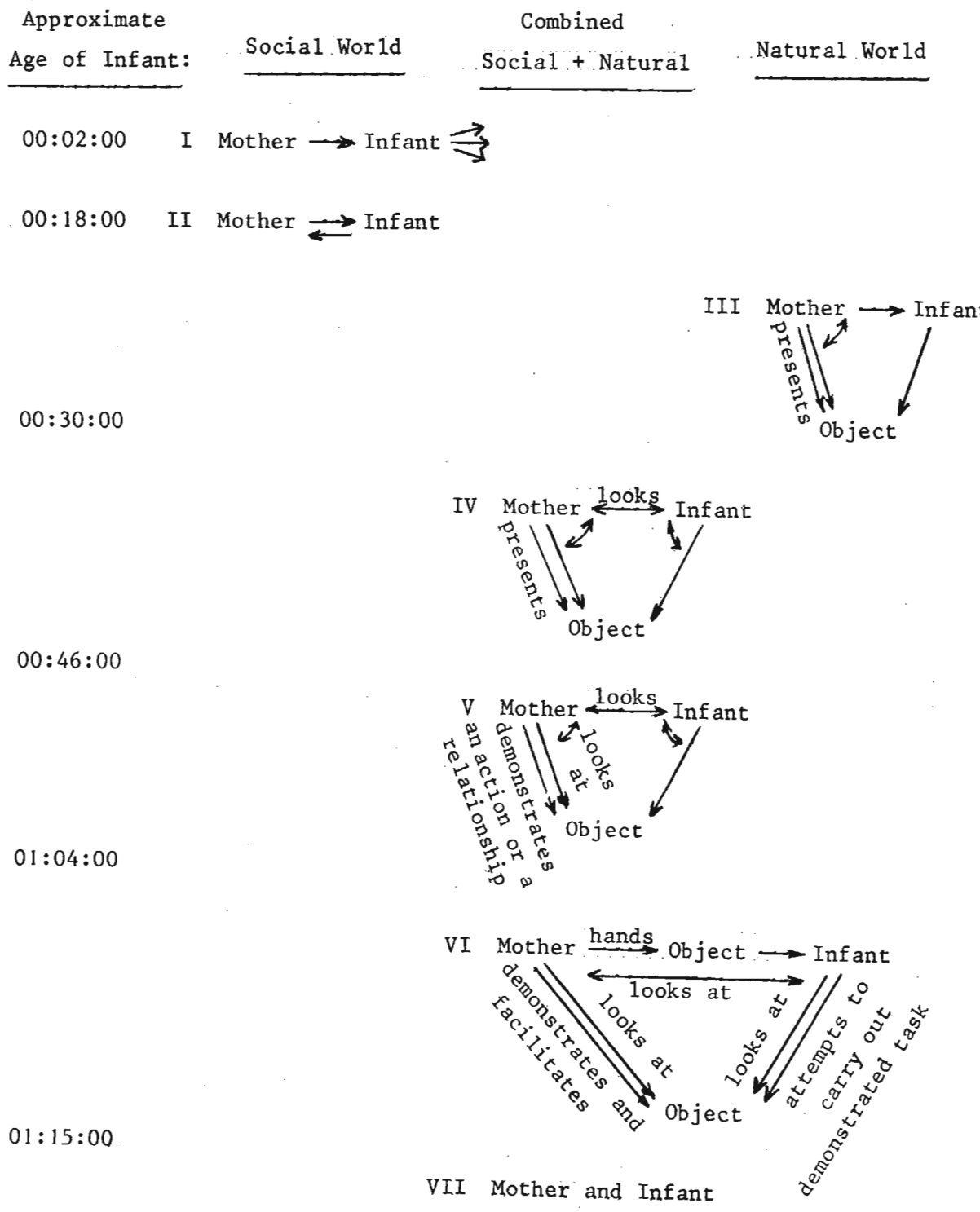
The social development which precedes the appearance of language is a complex one. An attempt has been made to provide behavioural criteria which demarcate the major transitions in the development of communicative competence in the preverbal infant. Although attention throughout this study has been directed at the mother and her infant, the qualitative changes in their interaction derive mainly from changes in the ability of the infant. The mother is a competent member of a social group, she already possesses adequate cognitive and social structures which enable her to act appropriately in the majority of the situations in which she finds herself. These structures will undergo various accommodations as she interacts with her infant. The infant, on the other hand, cannot be assumed to possess any structures, either cognitive or social. Her biological reflexes and predispositions provide the nucleus of them and will facilitate their development: but they are not present in the neonate.

Piaget in his theory of cognitive development has concentrated on a few reflexes and shown how these, through the processes of assimilation and accommodation and through the use of them, are elaborated into increasingly complex cognitive structures. These structures are intrinsic to the individual and are the means by which the individual adapts to the world. The focus of this research has been on the increasing competence and complexity evinced in the infant's social transactions and how gradually the social world and the natural world are accommodated into shared social structures. The natural world becomes something to communicate about, and increasingly structures social interactions.

In language acquisition the two areas of development, social world and natural world, are undifferentiated and must come to be differentiated so that they can be meaningfully interrelated. In this ontogeny the emphasis is initially on social development - the establishment of a phatic channel between mother and infant. Once this has been achieved, objects are introduced into it and the interactions may then assume the

form of communications about the world. This occurs, in embryonic form, in stage IV and from then on increasingly complex interactions about the world become possible.

The sequence can be diagrammatically illustrated:



The contributions of the mother to this development are considerable. This is apparent in every episode described. She sensitively adjusts her behaviour to suit the abilities of her infant and encourages and assists the infant in the achievement of increasingly complex tasks. Her contingent rewards for 'correct' behaviours and her apparently untiring entertainment of her infant validate the conclusion reached by Bowlby (1951, 1969, 1971) and others that a primary caretaker is essential for normal development. But whereas the focus in these earlier studies was on 'affection' or 'love', phenomena difficult to identify or measure, this research has provided criteria which are less emotive and more specific. This facilitated the study of the social development of the young infant and its mother.

The theoretical framework of the analysis has enabled the utilization of the concepts developed by Piaget for his cognitive theory, for example the concept of structure, of adaptation, of organization, etc. Their use has both facilitated analysis and, it is hoped, contributed to clarity. The relationship between cognition and communication has long been recognized[1], it is not surprizing therefore that the data on communicative development should fit so snugly into the framework of sensorimotor development.

This research has generated more questions, some of which are listed below, than it has answered.

The importance of longitudinal observational studies of early development cannot be over emphasized. As stated by Trevarthen (1977), the premature application of experimental studies does not supply answers to questions about the integration of the infant's behaviour, or, even more important, about the integration of the infant's behaviour with social others.

This study has attempted, at a rather gross level of analysis, to answer questions of this nature. The longitudinal record has been preserved;

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[1] See, for example, Piaget (1969), Vygotsky (1962), Herriot (1970).

therefore some of the hypotheses generated can be tested using the original data.

Extensions to this initial research are already in progress and more are planned. The three projects which have been commenced are:

(i) A study into the emergence of reference and deictic words. It has been found necessary to constrain the free play situation slightly by the introduction of specific routines which elicit the behaviours being studied. Obviously the routines introduced become more complex as the infant matures. The analysis of data conforms to that described in this report.

(ii) An attempt to identify the relative contributions made by the members of the 'asymmetrical dyad' to the communicative process. In this study the quality of interaction between a mother and her monozygotic twins is being compared with the interaction between the twins both with the mother present and absent. From a preliminary scanning of the tapes it is clear that the contribution of the mother is considerable. In her absence reciprocity, turn taking and co-operation are initially absent, to appear in primitive form at around one year of age. The order and manner in which the twins acquire the communicative skills in interaction with each other which they show in interaction with the mother is of interest.

(iii) An attempt to increase the efficacy of a language acquisition programme by introducing modifications derived from this research. Two language retarded children are being trained using this modified programme. This study has recently been commenced and no results are available.

Other areas in which further research is necessary are:

(i) Into the transition from pre speech acts to primitive speech acts. This is important because it marks the first appearance of regularities in the infant's vocalizations. To study this transition

phonetic analysis of the sounds associated with the communicative actions is a prerequisite. The stabilizing of specific phonetic patterns associated with specific communicative acts must be investigated and the factors which contribute to this stabilization identified, The transformation of these phonetically consistent forms (PCF) (Dore 1976) into conventional morphemes bridges the traditional border between prespeech and speech. As is evident from this data and from many contemporary studies, this barrier is an artefact of the view of language as a separate and distinct system.

The analysis required at these transition stages is extremely complex. A very detailed description of the actions of the partners and the context is required. Carter (1975) has described the transformation of a sensorimotor morpheme into two words, 'more' and 'mine'. It is this type of analysis which is required if the development of language is to be understood. Ideally the ontogeny of the sensorimotor morpheme itself should be studied. This could be done by going even further back, to the first appearance of a vocalization with the relative communicative act. The manner in which these PCFs and morphemes effect the structure of the communicative act is also important.

(ii) Into the necessary and sufficient elements of specific communicative acts. In the literature reviewed there was very little information found on the order of combination or introduction of the elements of communicative actions. The analytical methods developed in this research will enable the identification of these features. For example, the reciprocal function (R) of taking an offered object (4) can be easily isolated wherever it has occurred. Comparing the behaviours associated with each incident would enable one to identify the constituent elements of the action, their order of combination, the introduction of new elements and the changes which occur over time in the communicative action. The wide limits within which most communicative actions remain interpretable indicate that the analysis would have to be extremely complicated because it would have to include the entire range of behaviours subserving the communicative action. It is assumed that some of the units are more important to the

interpretation of the action than others. (This, too, is an empirical question.) The degree of complexity of analysis dictates that this be done by computer. This analysis is to be carried out in the near future.

(iii) Into the appearance of specific functions and their fluctuations in frequency. This will provide important information on developmental trends.

A natural extension of this is to identify (a) the order in which the functions appear in the infant's communicative repertoire, and (b) whether this order is maintained in the appearance of verbally expressed functions.

More general questions are also raised by a study of this nature. The generalizability of these findings across cultures and, within cultures, across socio-economic classes is of interest. Related issues concern the development of communicative skills where there is some gross distortion within the dyad, for example if either partner is deaf, blind or retarded. The absence of a primary caretaker, for example in institution reared infants, would also be a distorting factor.

These factors would probably influence the developmental schedule proposed. Studies of these and similar situations should contribute to an understanding of the complex developmental processes involved in the acquisition of social and communicative competence.

Comparison of mother-infant interaction in sub human primates may help to identify the factors which contribute significantly to linguistic skills. Preliminary scanning of videotapes of vervet mother and infant interaction indicate that eye contact between them is the exception rather than the norm. More detailed analysis may reveal other significant differences.

It is clear that more remains to be done than has been done. The

techniques developed in this research provide a rather crude tool with which to commence the Herculean task facing developmental psycholinguists. Inevitably, better techniques and methods will emerge. Even if the techniques and methods described in this dissertation are discarded they will have served their purpose if they have stimulated someone to improve upon them and have contributed in some way to our knowledge of the developing infant.

APPENDIX I

Furth's (1971) Account of Piaget's Theory of Knowing compared with Mediating-Representational Knowing.

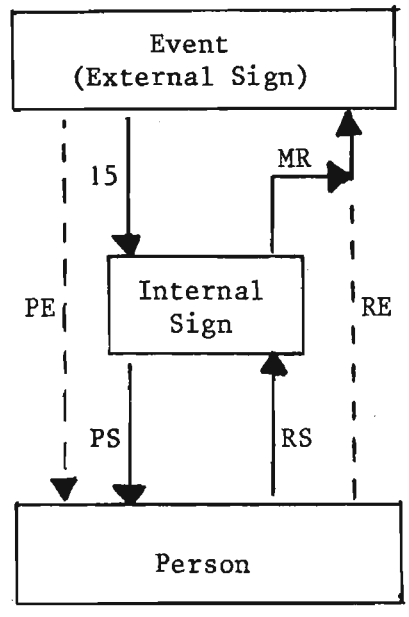


Figure 1 Diagram of Mediating-Representational Knowing. (PE = Perception of Event; RE = Reaction to Event; IS = Internalization (Real) of Sign; PS = Perception of Interior Sign; RS = Reaction to Interior Sign; MR = Mediating Representation.) (Furth 1971, page 287.)

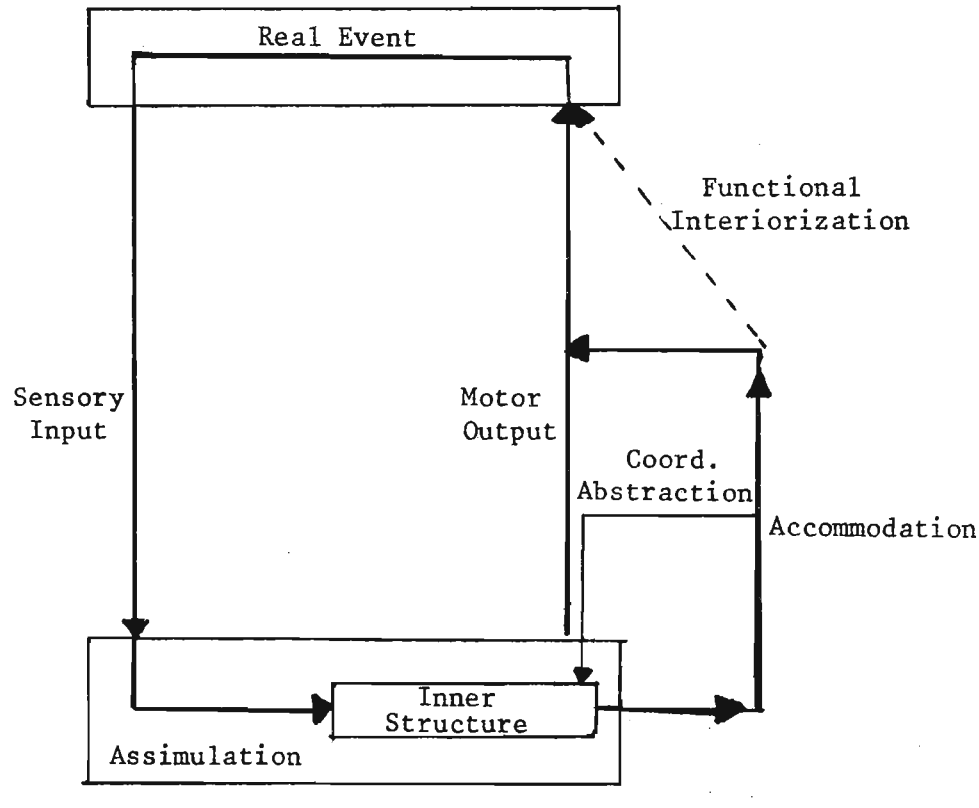
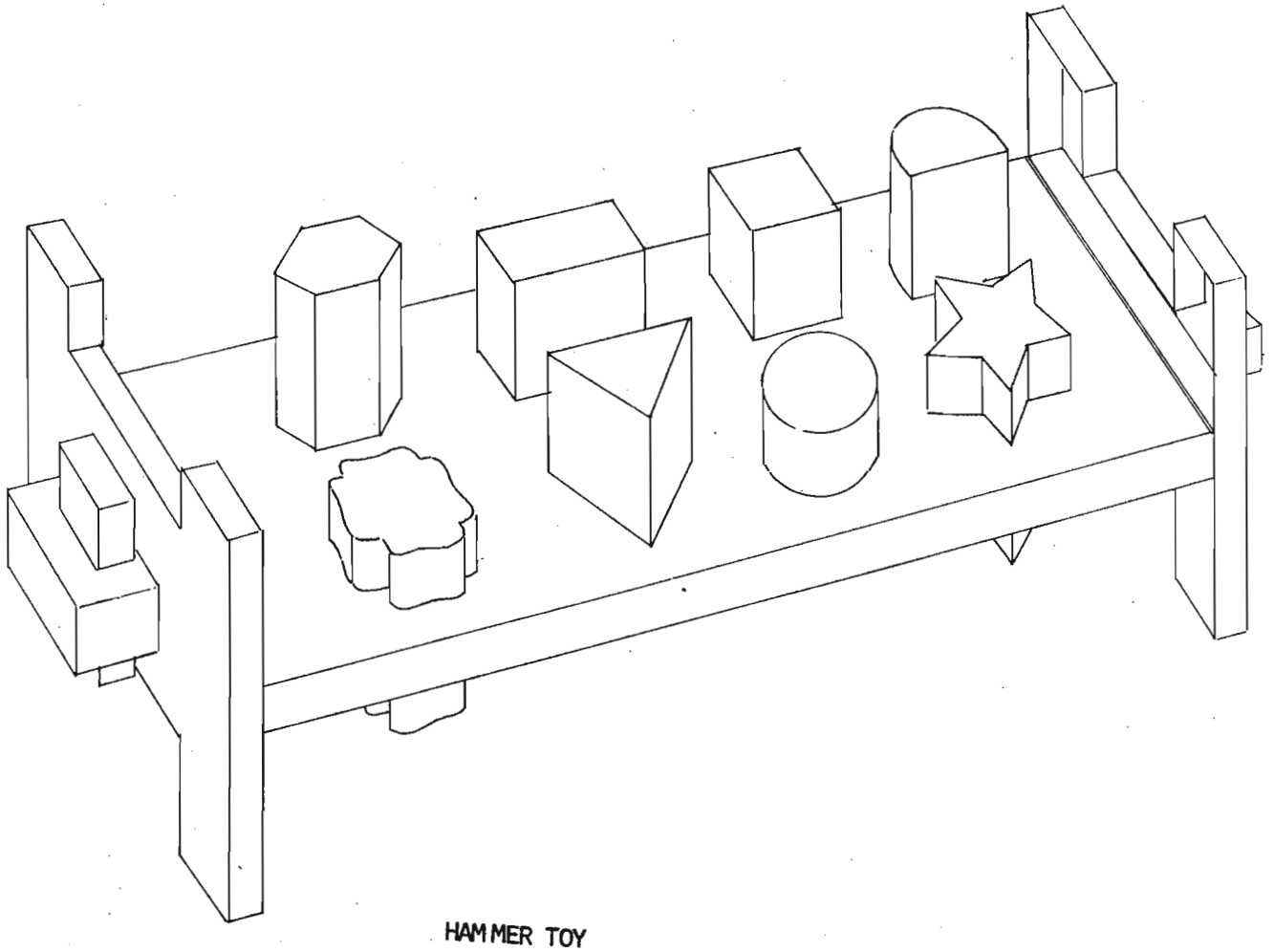


Figure 2 Diagram of Piaget's Theory of Knowing. (Furth 1971, page 290.)

APPENDIX II

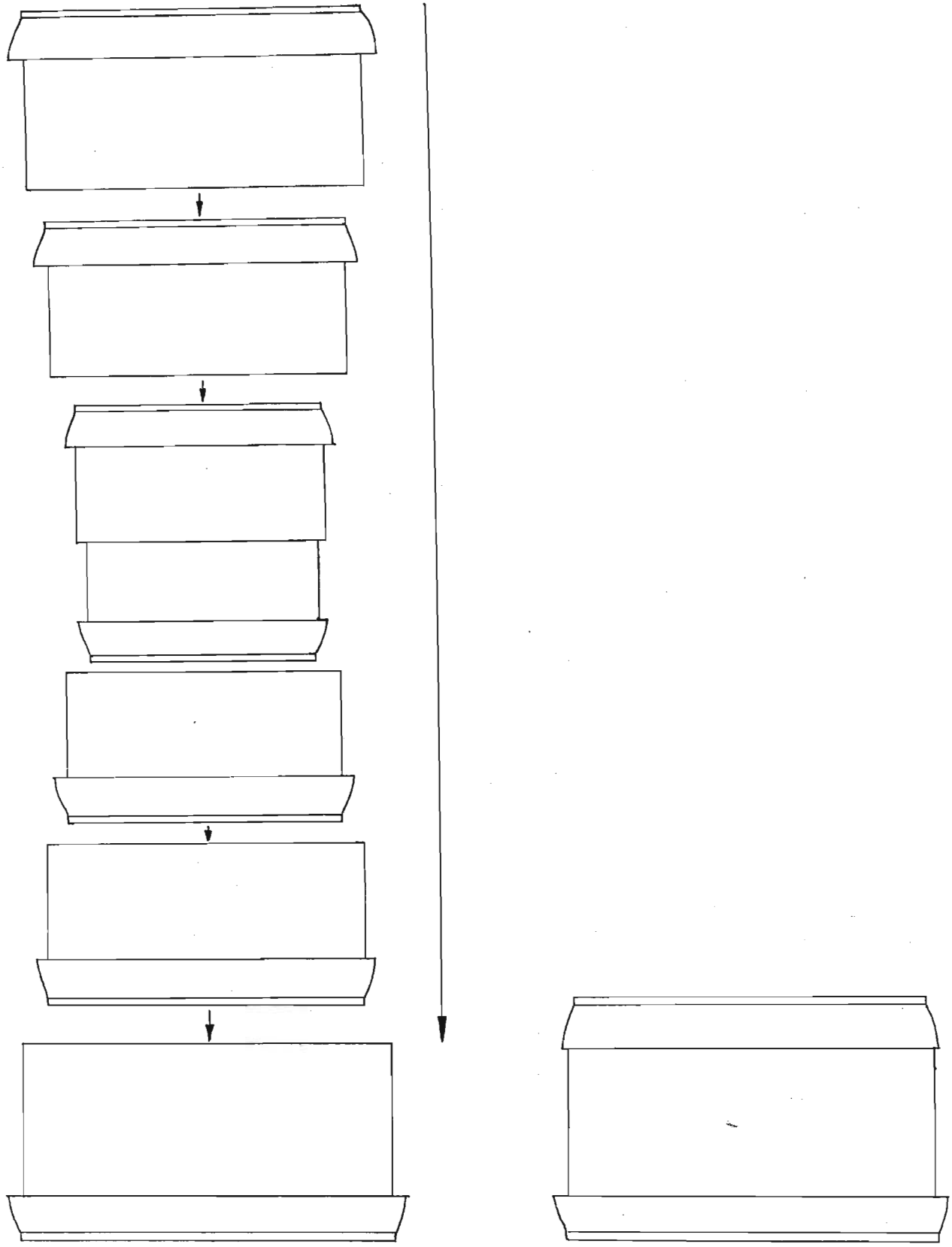
TOYS



HAMMER TOY

APPENDIX II

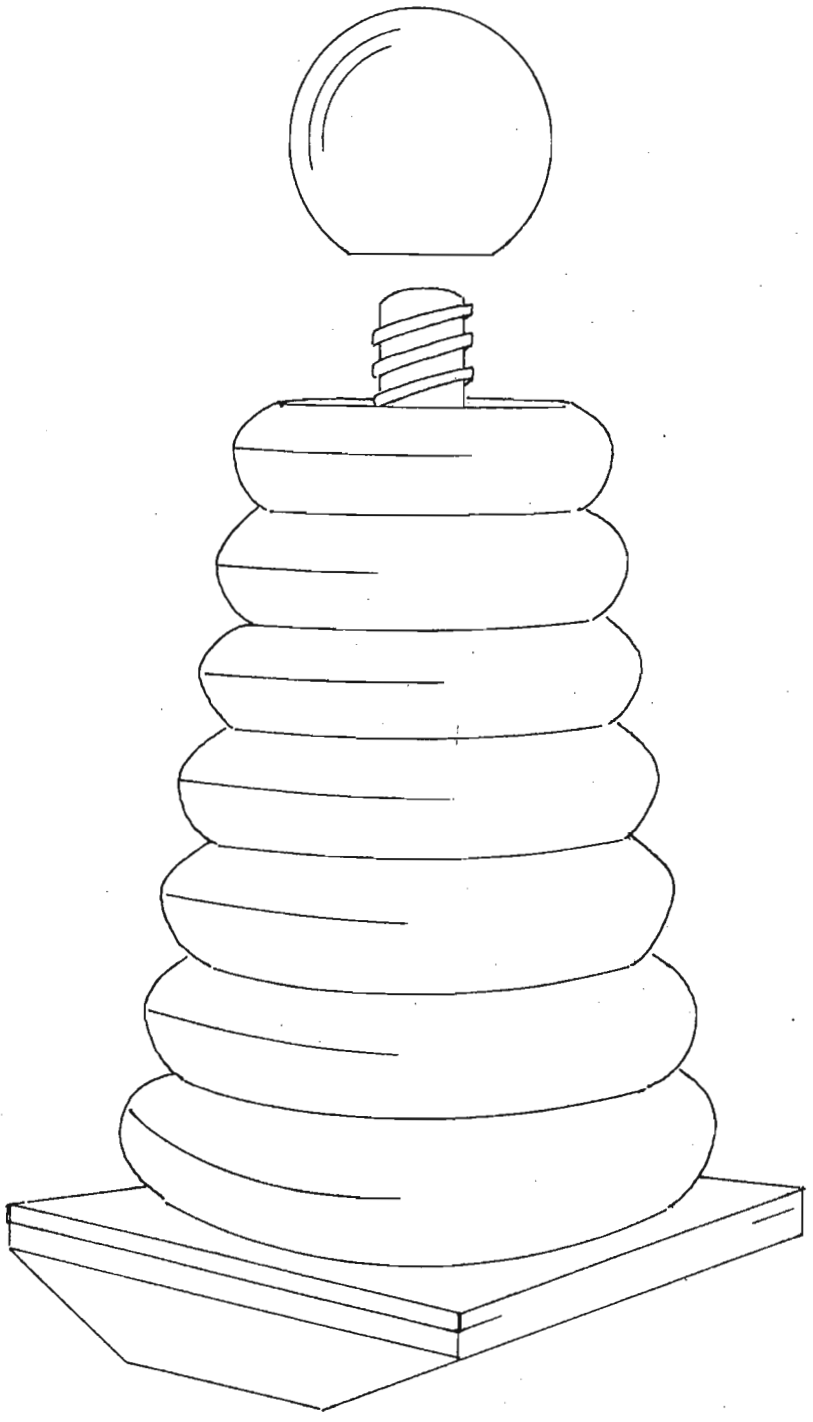
TOYS



CUP TOY

APPENDIX II

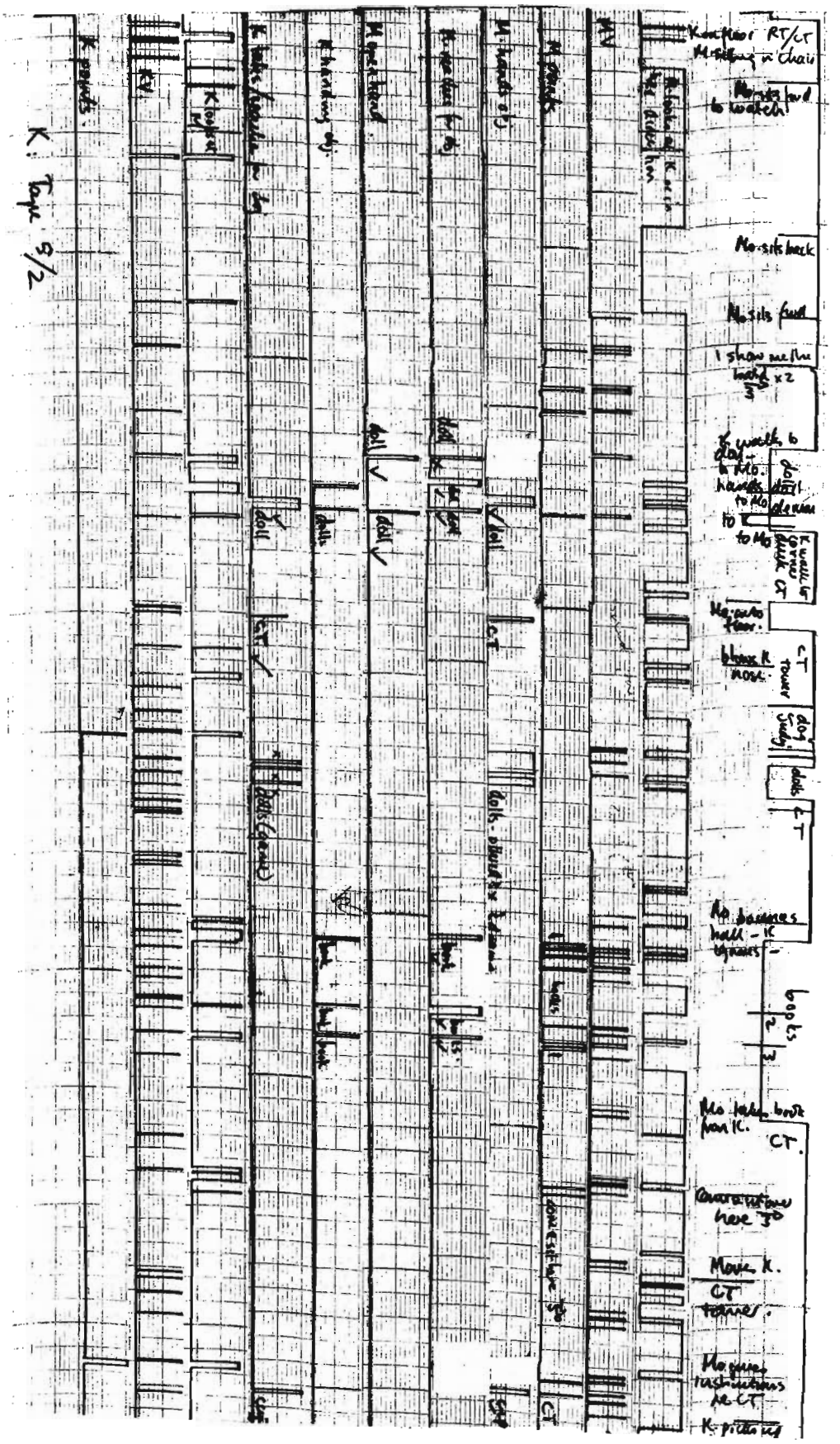
TOYS



RING TOY

APPENDIX III

Event Recording : K 01:20:00



APPENDIX IV

COMMUNICATIVE FUNCTIONS

C = Conative Function : Concerned with forming messages in such a way as to produce desired behaviour in the addressee.

H = Heuristic Function : providing information about the world or giving instructions as to how to act or (in action) demonstrating a certain procedure or assisting in carrying out a certain procedure.

E = Expressive Function : is made up usually of accompaniments to the addressor's feelings. In a primitive sense, its success or failure depends upon innate or early learned recognition routines.

R = Reciprocating Function : involves the carrying out of actions either in accordance with or contrary to the previous actor's intention but without continuing the sequence with another conative act. The sequence of interaction/communication is maintained.

T = Terminating Function : involves an action which terminates the sequence of interaction. The phatic channel is closed.

U = Unclassifiable.

Classification of Communicative Actions According to Presence or Absence of Vocal Elements.

I = Speech Act.
II = Primitive Speech Act.
III = Pre Speech Act.
P = Maintaining the Phatic Channel.

APPENDIX V

COMMUNICATIVE ACTIONS

0. No prominent feature.

1. (1) = object held up in front of partner.
   1 = placing object near partner.
   $\overrightarrow{1}$ = object thrust into partner's hand.
   $\overline{1}$ = object placed in partner's lap.
   $\underline{1}$ = object placed on partner's palm.

2. Action on objects:
   2 = which are involved in the activity.
   $\overline{2}$ = which are NOT part of the joint activity.

3. Extended hand:
   3 = palm up.
   $\overrightarrow{3}$ = pointed digit.
   $\overrightarrow{3}$• = tapping of digit.
   $\overrightarrow{3}$| = pointed digit touching object indicated.
   $\underline{3}$ = palm down, open hand.
   $\overset{\blacktriangle}{3}$ = extended hand with object in it.
   3/3 = both hands held out towards partner.
   3//3 = claps hands.

4.

5. Physical withdrawal of limb or whole body following an action in joint activity.

6. Reaches for object offered by partner: (e.g. in palm)
   6 = takes object.
   $\overline{6}$ = does not take object.

7. Gross motor action of a limb/s: movements repeated and poorly co-ordinated.
   $\overline{7}$ = not directed at an object.
   7 = directed at an object or at partner.

COMMUNICATIVE ACTIONS (continued)

8. Movement of hand/arm towards partner or towards object in game.

9. Head shaking:
   9↑ = up.
   9→ = side.

10. Stops an action e.g. crying.

11. Physical contact with partner.

12. Moving partner from one location to another:
   $\overline{12}$ = moving self from one location to another to remain in or to enter the joint activity.

13. Rhythmical movements of limbs (pedalling).

14. Mouthing movements.

APPENDIX VI

ACTION MODIFIERS

i.	Subscript	'g'	=	gaze at objects of the joint game.
ii.	Subscript	's'	=	gaze directed to partner.
iii.	Subscript	'gs'	=	gaze directed at object held by partner, or at partner's extended hand.
iv.	Subscript	'gf'	=	visual following of action of partner.
v.	Subscript	'gp'	=	gaze directed at object referred to, pointed at, or looked at.
vi.	Subscript	'go'	=	obligatory gaze.
vii.		+	=	smile.
viii.	Subscript	E	=	visual scanning of room.

ix. // under a subscript indicates that the behaviour terminated.

x. W preceding CA code indicates a verbalization.

V preceding CA code indicates a vocalization.

APPENDIX VII

GLOSSES

1. Requesting an object (option of refusal).
2. Demanding an object (no option of refusal)
3. Offering an object/giving an object.
4. Accepting an offered object (successfully or unsuccessfully).
5. Refusing a requested/demanded object.
6. Labelling an object/action.
7. Comment on an object.
8. Locating an object or a position (deixis).
9. Requesting permission to act.
10. Requesting an action (with option of refusal).
11. Command to act.
12. Complying with request/command for action or granting permission to act.
13. Refusing to act as requested/commanded or refusing permission to act.
14. Instructing how to act.
15. Demonstrating an action/object.
16. Scaffolding (assisting in the carrying out of an action).
17. Comment on partner's action.
18. Comment on own action.
19. Demanding attention.
20. Expressing approval.
21. Expressing disapproval.
22. Expressing sympathy.
23. Imitating an action.
24. Requesting information.
25. Undirected remark, e.g. OK, OK.
26. Comment on partner.
27. Terminating an interaction.
28. Greeting.

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