EDITORS' NOTE: At the back of this issue we have included cumulative indexes of the articles and annotated bibliographies that have been published in the *ICHD* and *LCHC Newsletters* from September 1976 through the present issue. In the future we will publish a cumulative index annually, in the last issue of the year.

Looking for Big Bird: Studies of Memory in Very Young Children*

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The period between one and three years of age is one of the most fascinating eras in human development: in no other comparable span of time do so many revolutionary changes occur. Cognitive processes undergo an extraordinary degree of reorganization as the child acquires language and makes the transition from sensorimotor to symbolic, representational thought. In spite of the importance of this early period, it has been relatively neglected by developmental psychologists until quite recently. One of the main reasons for this neglect has been the fact that young children are notoriously intractable research subjects; it is difficult to enlist their cooperation in the relatively artificial, unfamiliar tasks traditionally favored by psychologists, and even when they do seem to cooperate, their performance tends to be quite low (see, for example, Myers & Perlmutter, 1978). Although most parents recount numerous instances of their toddler remembering personally experienced events over days or even months, we are aware of no memory studies of young children where retention intervals of longer than 30 seconds have been used. It

seems reasonable to infer from this discrepancy that the procedures commonly used to study early cognitive development are inadequate.

In this paper we will report an ongoing research project on young children's memory for object location that is aimed at studying the emergence and early refinement of various self-regulatory skills. We have made extensive efforts to avoid artificial experimental formats and to develop naturalistic, meaningful situations. The basic task that we have selected for our current research involves memory for object location (i.e., remembering where something is in space so one can retrieve it later). This is a variant of the delayed response task introduced by Hunter (1917) and used by him to study memory in a variety of species, ranging from rats to his 1-year-old daughter, Thayer. The essential feature of the delayed response problem is that the subject watches while an object is concealed in one of several potential containers. After a specified delay interval, during which the child's attention is typically distracted from the containers, he or she is allowed to find the hidden object.

This general format has been used in several recent studies with children between 1½ and 3 years of age (e.g., Daehler, Bukatko, Benson, & Myers, 1976; Horn & Myers, 1978; Loughlin & Daehler, 1973). In the standard task 2-year-olds, for example, have been found to retrieve the object with no errors on slightly less than 50% of the trials (Daehler et al., 1976; Horn & Myers, 1978). The addition of visual and verbal cues to the spatial cues already present has sometimes increased the level of correct responding, to 66% with labeled pictures (Horn & Myers, 1978) and as high as 69% with containers differing in size (Daehler et al., 1976); but in other studies visual cues have not been helpful (Babska, 1965; Loughlin & Daehler, 1973). Thus, 2-year-old children generally perform above chance (Myers & Ratner, in press) in the standard delayed response task. Getting them to be correct more than half the time, however, requires the addition of carefully engineered cues. Furthermore, we wish to emphasize that in none of the above experiments was the delay interval longer than 25 seconds.

In our research our preliminary goals included devising a task in which we could ask very young children to

remember something for more than half a minute. Accordingly, we have attempted to transform the basic delayed response task into a relatively natural situation. It takes the form of a hide-and-seek game that the child plays with a small stuffed animal. Several days before the experiment, each subject is given a toy (Mickey Mouse, Big Bird). Then, following our instructions, the parents teach their child the hide-and-seek game. The children are told that Mickey Mouse is going to hide and that they have to remember where he is hiding so they will be able to find him later. On each trial the child watches while his or her mother (or father) hides the toy in some natural location in their home, with a different location used for each trial. The specific locations obviously depend on the particular home, but include places like behind or under chairs and couches, under pillows, behind curtains, inside desk drawers. A kitchen timer is set for a specified interval and the child is taught to wait for the bell to ring. When it does, the child is allowed to go retrieve the "hiding" toy. The children very readily learn the rules of the hide-and-seek game and show obvious delight and excitement in playing it.

While we hoped that the hide-and-seek task would elicit performance from young children that would more accurately reflect their memorial competence, it was also designed to enable us to study very early forms of self-regulatory skills. These skills are the various processes by which people organize their thoughts and actions (Brown, 1978; Brown & DeLoache, 1978), including activities such as: *planning* ahead, *predicting* the outcome of some action (what will happen if?), *monitoring* ongoing activity (how am I doing?), *checking* on the results of actions (did that work, did it achieve my goal?), *correcting* errors or inadequacies (since what I just did didn't work, what would be a reasonable thing to try now?). These skills are the basic characteristics of efficient thought throughout life, and one of their most important properties is that they are transsituational. They apply to a whole range of problem-solving activities, from artificial experimental settings to everyday life. It is equally important to exercise these skills whether you're reading a textbook or a recipe; whether you're trying to remember who the seventh President of the United States was or where you left your car keys.

What we are referring to here as self-regulatory skills have often been described as a form of metacognition, and they are subsumed under Flavell's (1978) definition of metacognition as "knowledge that takes as its object or regulates any aspect of any cognitive endeavor." However, it is worthwhile noting that this definition comprises two (not necessarily separate) clusters —*knowledge* about cognition and *regulation* of cognition. The first concerns the relatively stable information individuals have about cognitive processes, tasks, strategies, and so forth, in general, as well as the knowledge they have about themselves engaged in those activities and tasks. We would not expect very young children to

be capable of this sort of metacognitive activity, i.e., conscious knowledge about cognition. Indeed, Wellman (1977) has demonstrated the very meager extent of such information possessed by 3-year-old children.

It is the second cluster of metacognitive activities included in Flavell's statement, the self-regulatory skills, that we are interested in here. These might be expected to be exhibited by very young children as they attempt to learn or solve problems. However, unlike the activities in the first cluster, whether or not the self-regulatory mechanisms appear depends critically on the nature of the task and the expertise of the child.

One of the prerequisites to observing very early examples of self-regulatory activities is the existence of an appropriate task, one that challenges young children (so that planning, monitoring, and so forth might be helpful), yet that falls within their general competence. Otherwise, even if they have, or are at the point of developing, any rudimentary self-regulatory skills, they may be too overwhelmed by the novelty and difficulty of the task to exercise those skills (Shatz, 1978).

Several features of our hide-and-seek task should increase the likelihood of finding self-regulatory behavior in very young children. The task requires retrieval to be manifested in overt action — finding an object in the environment — rather than the purely internal retrieval of information from memory. In this situation, external cues can be used, and the desired goal state (as well as success or failure in attaining it) is obvious, even to a young child. In addition, the task takes place in the home and with parents, and there is evidence that self-regulation occurs earlier in natural and familiar settings than in artificial, unfamiliar ones (Istomina, 1977). This naturalism of the hide-and-seek task helped us avoid some of the common problems associated with testing children between 1 and 3 years of age. A frequent problem is that one is often not really sure whether the child completely understands the task. The extensive pretraining provided by their parents ensures us that our subjects clearly understand the task before being observed. Also, the children typically enjoy the hide-and-seek game enormously, so they are motivated to participate fully. This is critical, because getting young children to *want* to do whatever it is you want them to do is one of the most difficult aspects of working with them.

We have now completed three studies involving 41 subjects between 18 and 30 months of age.[1] The children participated in a total of four to eight trials of the basic hide-and-seek task for one or two observation days. Except for the first two trials in Study I, the delay intervals were either three or five minutes. (Notice that these are exceptionally long intervals for use with this age group. As stated before, the standard delayed response studies with toddlers have used intervals of less than 30 seconds.)

In all three studies the children's baseline perform-

ance was excellent. They went directly (with no errors of any kind) to the hidden toy from 71 to 84% of the trials. For purposes of comparison the subjects in each study were divided into older (25-30 months, mean age = approximately 27 months) and younger (18-24 months, mean age = approximately 20 months) groups. The older children generally did somewhat better (with between 83 and 96% errorless retrievals) than the younger ones (58 to 71% correct).[2]

Although the three- and five-minute intervals we used were much longer than any in the developmental literature, they did not appear to give our subjects much difficulty. In order to examine their performance at much longer intervals, we recruited most of the mothers of subjects in Study I to serve as surrogate experimenters. Each mother made five observations of her own child in the hide-and-seek game — two with 30-minute intervals, two at 60 minutes, and one overnight. They were cautioned to put the toy somewhere the child would not happen upon it by chance. Since the mothers had been given extensive instructions about how to conduct the game with their children, and since we had observed all of them playing with the children, we were fairly confident of their ability to make objective and accurate observations for us. However, as a partial check on their data, one of the regular experimenters was present for one of the 30- or 60-minute observations for each child.

The children did surprisingly well at these longer intervals. They found their toy (with no errors) 88% of the time after a 30-minute wait, and 69% after an hour. After the overnight interval, they scored 77% errorless retrievals. (Several children, after the overnight hiding, retrieved their toy before their parents got up in the morning. One long-suffering mother informed us that her child woke her at 5 A.M. wanting to go downstairs and get Big Bird.) On the occasions we formally observed, the children *always* found their toy, so it seems reasonable to assume that the mothers' reports were not exaggerated.

Most of the children were also given a more complex task on later observation days in Study I. The same basic procedure was followed, except that on each trial three toys were hidden, each one in a different place. After an interval of either three or five minutes, the child was instructed which of the three toys to retrieve (with each serial position during hiding tested equally often). The child was then encouraged to find the other two toys as well. This multiple hiding procedure might be expected to produce a great deal of interference, since each trial involved three different toys hidden in three different locations, and sometimes a location was used more than once over trials. However, performance was again surprisingly good. On 67% of the trials the subjects retrieved the specific toy requested. Overall, they found 70% of the hidden toys, with a mean of 2.1 toys found per trial. These figures were closely replicated in a similar task in Study II.

The data reported so far argue forcefully that if freed from the artificial constraints and demands of standard laboratory tasks, very young children may be willing to demonstrate more of their cognitive competence than they have heretofore done. Given that our young subjects did so well in the standard hide-and-seek task, it seemed reasonable to think that variations in it might elicit some simple forms of the self-regulatory skills in which we are interested. In fact, we believe that in Studies II and III we have evidence showing the appearance of one such skill, intelligent self-correction, during the age period between 18 and 30 months.

A major goal of these two experiments was to examine what can be considered a rudimentary form of metamemory: we wanted to assess how confident our subjects were of their own memory. Only a few studies have examined metamemory in children as young as three. Wellman (1977) investigated 3- to 5-year-olds' knowledge of the effect of various task variables on memory difficulty, and Wellman, Ritter, & Flavell (1975) observed the use of primitive precursors of deliberate memory strategies by 3-year-olds but not 2-year-olds. No form of metamemory has to date been noted for children under three.

An extremely simple form of metamemory would be the assessment of how well or how certainly one knows something. Since our subjects' performance was generally so high, one would expect that they would be quite confident that they remembered correctly, even if they were incapable of verbalizing that confidence. A standard way of assessing certainty in preverbal infants and young children is to present a surprise trial (Charlesworth, 1969; Gelman, 1972), where the experimenter does something to disconfirm the subject's expectations. The degree of surprise shown is used as an index of how strong the expectation was.

Each subject received two surprise trials on which the toy was hidden as usual, but was surreptitiously moved by the experimenter while the child was out of the room on some pretext. The surprise trials were embedded (as Trials 2 and 5) in a series of six or seven standard hide-and-seek trials (i.e., ones in which the toy was not moved). The surprise trials were administered on a separate day following the standard hide-and-seek testing described earlier.

In Study II two observers independently recorded and coded the subjects' behavior upon looking for and not finding the toy where it had been hidden. To be conservative, we have included only behaviors noted by both observers on the surprise trials. In Study III, the subjects were videotaped while participating in the game in their homes, so data from that study have been scored from the tapes. The figures that follow reflect the combined data from the two studies.

The experimenters' subjective impressions were that the children were very surprised indeed not to find their toy on the surprise trials. Several behaviors indicative of

surprise were coded and analyzed (including verbalizations and negative emotional reactions), and they substantiate the experimenters' impressions. In this paper we will discuss in detail one of our surprise measures — the patterns of searching other locations after failing to find the toy in the correct place.

We should first mention that in general, the children almost never searched a location that had not been used previously, either on that day of testing or on a previous day. This was true for both age groups, and for both surprise trials and those trials on which subjects happened to make errors. Thus, the children had some general recollection of the set of hiding locations used.

The older and younger groups displayed different patterns of searching after failing to find their toy on surprise trials. The older children generally behaved in an intelligent fashion, much as an older child or an adult would do. After looking in the correct location and not finding the toy, they usually (on 88% of the surprise trials) searched somewhere else for it, and on the majority of the trials (76%) their searches fell into one or more of the following categories: (1) an adjacent location — if the toy had been hidden under one couch cushion, they might look under the next cushion; (2) a nearby or related location — if the toy had been put in a chair, they might look under or behind the chair; (3) an analogous location — if the toy had been hidden under a pillow at one end of the couch, they might look under the pillow at the other end of the couch; and (4) on the second surprise trial only, they sometimes looked in the place to which the experimenter had moved the toy on the first surprise trial.

The younger children were much less likely to conduct additional searches after failing to find their toy. On slightly over half the surprise trials (54%), they did not look in any other location after searching the correct one. They would often wander around in the middle of the room or stand near their mothers, apparently at a loss for what to do next. Some of the younger subjects returned to the correct location and searched there again, sometimes repeatedly. On only 26% of the surprise trials did the younger children search in the kind of related areas favored by the older subjects. They were just as likely, when they searched somewhere, to go to a place where the toy had been hidden on an earlier trial (especially the immediately preceding one). This tendency to search a prior location is reminiscent of the Stage IV error in object permanence (Harris, 1975) and the perseverative errors frequently observed for toddlers in memory and problem solving tasks (Webb, Massar, & Nadolny, 1972).

The older children's tendency to search additional locations on surprise trials reveals a form of certainty of memory in that they concentrated their searching in areas that were nearby or logically related to the correct location. They looked in places where the toy might reasonably be. They seemed to allow for the possibility

that they misremembered some detail ("maybe it's under this cushion instead of that one") or that some fairly plausible event intervened ("maybe the toy fell out of the chair"). One subject verbalized exactly this: he looked in the desk drawer in which his toy had been hidden, said "Did Mickey Mouse fall out?", and then proceeded to search behind the desk. The children were also alert to the possibility that the experimenter was tricking them a second time.

To summarize, both the younger and older children seem certain of their memory for the correct location, but they differ in their ability to re-evaluate the situation after failing to find the toy and in their flexibility in initiating alternative measures. The younger children most often do nothing at all. When they do, they are as likely to simply go to a prior hiding place as to search in a related location. The older children are more flexible and logical in their attempt to deal with the disconfirmation of their expectations. They are able to reflect on the situation and consider where the toy *must* be, given it is not where they remembered. To account for its absence, they appear to consider plausible physical or mental explanations: something happened to the toy, or some detail of their memory must be faulty.

These examples of logical searching on the part of the older children (and a few of the younger ones) represent the exercise of a self-regulatory skill—thoughtful correction of errors. When the children fail to find the toy, they can only assume that they are in error (at least on the first surprise trial). They then try to correct that supposed error by thinking about where the toy is most likely to be. They proceed to conduct the same sort of organized, logical search that an adult might do. If you remembered that you had left your car keys on top of the kitchen counter but then couldn't find them, you would probably look for them behind the cookie jar on the counter and on the floor around the counter.

In conclusion, these very young children performed very competently in our basic hide-and-seek game, which they completely understood and thoroughly enjoyed playing. Even when the game was modified to be presumably more difficult, with multiple hidings and delay intervals extended to as long as an hour, they maintained an excellent level of performance. Furthermore, they showed what is probably the earliest evidence yet observed of self-regulation by the logical search procedures they employed on the surprise trials. The competent and sophisticated behavior of our young subjects suggests that if tasks are made more comprehensible and meaningful to young children, they will be more enthusiastic research participants and provide us with more valid data.

FOOTNOTES

[1]The number of subjects and their mean ages in the three studies were as follows: Study I — 17 Subjects, mean age = 23 months (Older = 27 months, Younger = 20 months); Study II — 12 Subjects, mean age = 24 months (Older = 27 months,

Younger = 22 months); Study III — 12 Subjects, mean age = 24 months (Older = 28 months, Younger = 21 months).

²The complete data on errorless retrievals in the three studies were as follows: Study I — 76% correct overall (Older = 85%, Younger = 67%), Study II — 84% correct overall (Older = 96%, Younger = 71%); Study III — 71% correct overall (Older = 83%, Younger = 58%).

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Some Aspects of Literacy in Ancient India

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The relationship between the achievement of literacy and the organization of intellectual activity has been a matter of long standing debate among scholars. An unfortunate aspect of this discussion is the narrow data base upon which alternative theories have been based. Alphabetic literacy as it arose in Greece is certainly an important case to study, but considering the close link between literacy and social organization posited by some scholars and the equally close links between literacy and thought or social organization and thought proposed by others, it seems important to look for other settings that might yield evidence about the important causal relations that link literacy, social organization, and thought.

This paper examines some features of the literature (in the broadest sense of "any preserved linguistic artifact") of ancient India as it relates to these questions. It is motivated by my reading of the work of Goody (1977) and Havelock (1963). Goody suggests that listing and tabulation are important structural features of early literate activity; while he does not claim that writing is essential for listing and classification, he does hold that these activities are influenced owing to their embodiment in literate practices. A corollary notion, proposed earlier by Havelock (1963) also seems to be accepted — that writing displaces oral forms of cultural transmission.

Here I will describe in some detail the organizational techniques embodied in two of the oldest fields of formal knowledge available to us, the veda and the grammatical literature. A more general discussion of literacy in China and India may be found in Gough (1968).

At the outset we must point to a contradiction suggested by the case of literacy in ancient India. The Indian case runs counter to the one observed by Havelock (1971, p. 15), who noted the fact that in Greece the first things written were things oral. The Greek practice seems quite natural — after all, what else was there for them to write with their new tool? Our problem is that India produced a great variety of highly developed,

specialized knowledge, and at the same time maintained that the only sanctioned method of transmitting this knowledge is oral. On the one hand, oral transmission has preserved the material with a great deal of accuracy, and on the other, the use of writing hardly displaced oral transmission until relatively recent times. And although Indian literature regularly exhibits features deemed typical of oral transmission — repetition, formulation, diectic reference — much of the literature seems inconceivable without writing. Though an oversimplification, it is revealing to say that when writing was adopted, India (may have) preserved written compositions by oral transmission (though India's oral literature did of course also eventually find its way into writing), whereas Greece preserved oral compositions in written form. The question is complicated by the fact that the date (which is of course crucial in sorting out cause and effect) of the introduction of writing into India is not known. There is ample literary evidence (Goldstücker, 1861; Bühler, 1898) that writing was fairly widely used in the fifth and sixth centuries B.C., and it now seems to be generally presumed that writing was introduced from some Semitic source (Dani, 1963) in the eighth century B.C., about the same time it was adopted by the Greeks.

It is important to keep the material discussed here in perspective. The extant literature of ancient India is vast, the greater part of it being composed in Sanskrit but with a significant portion in related languages. The elaborately inflected Sanskrit language is preserved in two forms, the vedic and the classical, and a concomitant distinction is made with regard to the literature. The veda, as the sacred literature of the orthodox Hindus is known, includes large collections of hymns and ritual instructions, regarded as ancient in the classical period. The classical literature spans a period of two thousand years and includes ornate courtly poetry and drama, epic poetry, law, astronomy, mathematics, medicine, epistemology, logic, an extensive linguistic literature, and the voluminous religious literature.

The language of the veda is about as far removed from the classical as Chaucer's is from ours. The very fact of this distance and the consequent unintelligibility of the ancient sacred literature turned Indian scholarship in a unique direction — to the study of linguistics. The veda and grammar formed the foundation of almost all literary activity and were the basic subjects of instruction. Great effort was made to understand them and they in turn were used to explain other fields of intellectual endeavor, being quoted constantly, much as an educated person of the recent past might quote the Bible or Euclid.

The term "veda" (lit. "knowledge," from the root "vid/know") is used collectively to denote the four vedas: *Rgveda, Sāmaveda, Yajurveda,* and *Atharvaveda.* Each veda has a metrical portion called "mantra" and a prose portion, consisting of explanatory and interpretive material, called "brāhmaṇa," composed after a lapse of some generations and substantial social change to provide a reinterpretation of earlier practices.

The mantra portion of the *Rgveda* consists of 1028 metrical hymns of from one to fifty-eight stanzas each, approximately 10,500 verses in total or about the same size as the *Iliad* and *Odyssey* together. Internal evidence shows that the collection grew from a set of six books (numbers 2-7) containing less than half the hymns, each composed, presumably over a period of several generations, by members of a single family. Four more books were added later in stages, one containing all the soma hymns, the others partially arranged according to author, similar to the original core.

Some clear principles of order are evident within this structure. The six family books are arranged (excepting some later additions which violate these principles) in order of ascending quantity — each succeeding book contains more hymns and more total stanzas than the preceding and begins with hymns addressed to Agni, then to Indra, followed by short groups of hymns to lesser deities; those to each deity are arranged according to number of stanzas in descending order. The remaining books follow the same principles where applicable, but other factors frequently alter their arrangement. The date of this arrangement is controversial, but 1000 B.C. is now considered not unreasonable.

The *Sāmaveda* is primarily a rearrangement of a portion of the hymns from the *Rgveda,* in an order more convenient for liturgical purposes, thus forming the handbook of one of the principal priests (there could be as many as seventeen involved) engaged in the elaborate sacrificial ritual. To simplify the principles of arrangement somewhat, it consists of 1810 verses distributed in two books. The first book contains 585 unconnected stanzas used as paradigm cases for the melodies sung in the ritual, arranged in groups of ten according to metre and diety. The second book is made up of small groups of stanzas (whose first verses often occur in the first book, the "tune" book) arranged by ritual in the order used.

The *Yajurveda* holds brief ritual formulas used by a priest as he carries out details of ritual actions. It exists in two versions which, though related, differ considerably — the *Black* (krṣṇa/dark) *Yajurveda* with explanatory brāhmaṇa material in prose interspersed with the more or less metrical formulas, and the *White* (sūkla/light, clear) *Yajurveda* with its brāhmaṇa material edited out into a separate portion. In both versions the mantras are arranged according to ritual use.

The *Atharvaveda,* much of which applies to domestic ritual, especially that of the royalty, survives in two markedly different recensions, neither of which is as well-preserved as are the other vedas. The contents of both are arranged in a basic plan according to subject matter with numerical criteria employed in subdivisions. It is largely metrical but some prose material is included, significantly more in one of the recensions.

Each of the four vedas also possesses additional prose material, of great bulk in some cases — explanations of ritual symbolism, etymologies, myths, teacher lists — typically divided into brāhmaṇa, āraṇyaka (lacking in the *Sāmaveda*), and upaniṣad, with a difference in the content of each division reflecting chronological development extending over five centuries. Different schools of priests produced their own brāhmaṇas, so a particular mantra collection may have more than one brāhmaṇa dealing with it. The subject matter of these is quite varied, but they have been characterized as pre- or proto-scientific on the grounds that they exhibit principles of order, a concern with cause and effect, a search for coherent explanations. The final chapters of these collections are the upaniṣads, containing metaphysical speculation and the new esoteric doctrines of ātman, karma, and rebirth. The oldest of the principal upaniṣads may come from as late as the fifth century B.C. The transition of the language to the classical dialect is here complete.

We cannot say that the upaniṣads "close the book" of the revealed knowledge of the divine, for it is not clear that this material properly constitutes a "book," even though it has here been called literature. No one disputes the claim that all this literature was composed orally and transmitted orally for many generations. The explicit statements to this effect found in the literature itself are supported by the many features considered typical of oral literature. Extraordinary efforts were made to ensure the preservation of this sacred knowledge *by oral transmission.*

These efforts may be seen on three levels. First, the arrangement I have described has itself great value as a mnemonic technique. This fact was recognized by the earliest known commentator on vedic material, the grammarian Yāska (*Nirukta* 1, 20) in a succinct history of vedic bibliography: "The ṛṣis had direct insight into dharma. By oral instruction they handed down the mantras to later generations who lacked direct insight into dharma. To contain the lore when they exhausted the oral instruction the later generations collected this book (i.e. the work being commented on, the *Nigaṇṭu*), the veda, and the vedāṅgas."

Second, the ancient priestly schools developed various ancillary disciplines, six vedangas, "limbs of the veda," referred to in the above quotation, four of which concerned linguistic problems — phonetics, metrics, grammar (including both morphology and syntax), and etymology. (The other two deal with sacrifice and calendric astronomy.) The purpose of these fields of study was to preserve the knowledge of the correct performance and meaning of the mantras. Not formally included in the vedāṅgas but serving the same purpose were five metrical indexes giving lists of ṛṣis, metres, deities, sections of the *Ṛgveda* and the numbers of stanzas in hymns. Yet another class of works exists, called prātiśākhyas, which contain rules for the formation of

each word of the veda, whose application will become clear in a moment.

Third, the priests memorized various ways of reciting the text which served as a set of redundancy checks to help preserve it. The basic reading as used in the ritual — what we might call the constituted text — was called the saṁhitā text, which involved a tonal accent and elaborate euphonic blending between words and in compounds, motivated by a desire to avoid hiatus. The words are here "put together" (sam + dhā) to give the constituted text (saṁhitā/what has been put together) and thus exhibit "saṁdhī," the euphonic changes made to the ends and beginnings of most words (which have always been indicated in writing).

Saṁdhi is the source of some problems of interpretation in the text which are often removed when the words are resolved to their isolated forms. This is provided by the pada (word) text, which is the most fundamental exegesis of the veda. It states each word in its properly inflected form but without saṁdhi, thus eliminating some cases of ambiguity especially with regard to negation. Mantra 10, 90, 2 provides the following example. The saṁhitā text reads: "puruṣa evedaṁ sarvaṁ yadbhūtaṁ yacca bhavyam" which appears in the pada text as "puruṣaḥ eva idaṁ sarvaṁ yat bhūtaṁ yat ca bhavyam." ("All this which was and is to be is just the [supreme or primordial person.") While the achievements of this text should perhaps not be exaggerated, it involves a recognition of the individual word abstracted from the flow of speech and does reflect a thorough knowledge of phonology and it forms the basis of other exegesis. This is the text to which the prātiśākhyas apply, giving the rules to form the saṁhitā text from it.

From the pada text are formed three different recitations in which the words are repeated in various orders: the krama text arranges the words in the sequence ab, bc, cd, etc.; the jaṭā text reads ab, ba, ab, bc, cb, bc, cd, dc, cd, etc.; and the ghana text reads ab, ba, abc, cba, abc, bc, cb, bcd, dcb, bcd, cd, dc, cde, edc, cde, etc. Most male brahmins memorized — in training traditionally beginning at age twelve and lasting for twelve years — the mantras of at least one veda this way, as well as the brāhmaṇa and vedāṅgas developed in their own school. Each mode of recitation was accompanied by a conditioned motor activity serving yet another mnemonic function: the head was raised or lowered for corresponding tonal accents and the hands made various signs for the vowels. These practices survive to the present day and may be seen in the remarkable anthropological film by J. F. Staal, *Vedic Fire Ritual* (cf. Staal, 1961). Frequent mention is made in the ancient literature of teachers who knew three or even all four vedas, and this was often accompanied by specialized knowledge of some other field of literature such as law or grammar.

The date when the veda was finally written is quite problematic. It is often repeated (e.g., by Gough, 1968) that it was not written until the fourteenth century A.D.,

the date of the first complete commentary we have, but fragments of earlier commentaries are now available. R. M. Smith (1966), basing his opinion on his critical study of the lists of teachers contained in the brāhmanas, concludes that the vedas must have been put in writing around 150 B.C. It is even possible to interpret the remark of Yāska quoted above as referring to writing them, thus placing the event prior to ca. 500 B.C. At the same time there existed a widespread taboo against writing the veda, expressed in the damnation of those who write them (along with the defilers of the vedas) found in the *Mahābhārata* (13, 24, 70 Poona edn.) and referred to by the fourteenth century commentator when he says in his introduction that recitation should be perfect "because reading manuscripts is prohibited" (despite his own evident use of a manuscript). It is in any case clear that the vedic literature was composed and most of it arranged as described here before writing became available.

However that problem is resolved, we must observe that Havelock (1963, 1971) was mistaken to insist that material for memorization be narrative verse. In fact every kind of "inexpressible and also unthinkable" analytic statement — the sheer catalogue, technical information, moral judgment, universal definition, Kantian imperative, mathematical relationship, epistemology, logic — mentioned by Havelock (1963, esp. ch. 10) is found in abundance in Indian literature, and while some may be the product of writing, they were nonetheless meant for memory and voice.

Perhaps the most important observation possible at this juncture is that list-like characteristics pervade this literature. Not only are numerous lists (which have not been noticed here) contained in it, the very body of the literature is organized in one great list. And it is not only a list, it is an ordered list, arranged on rational principles. This practice of presenting knowledge as an ordered list finds its greatest development in the sūtra literature, a large genre including subjects such as ritual performance, socio-religious law, philosophy, and grammar.

There is a general trend to formalization and organization in all known fields of knowledge beginning ca. 8th-7th c. B.C. The pressure to clarify ever more confusing traditions must have been strong — with some hyperbole the subcommentator on Yāska's passage quoted above explains that the arrangement was made for ease of understanding since there were twenty-one recensions of the *Rgveda,* one hundred and one of the *Yajurveda,* a thousand *Sāmavedas* and nine *Atharvavedas.* (The first and the last figures have some possible validity, the others are conventional expressions for "many.") For example, a little-explored class of literature developed which codified rituals in brief formulaic statements called sūtras. The ritual was analyzed so that simple, self-contained actions could be organized into complex wholes, elaborate sacrificial ceremonies lasting days or longer. Rules were formulated for combining

the small acts so that we may, as Staal has done (in work so far unpublished), seek to describe a "ritual syntax" for the classical vedic sacrifice.

The term "sūtra" (lit. "thread," sometimes translated by "aphorism") refers to the form of statement made in this literature (as well as to the works) which aims for concise precision to such an extreme degree that it may be unintelligible without explanation. This form was most thoroughly developed by the grammarians. The standard Sanskrit grammar was the work of Pāṇini, who flourished ca. 450 B.C. (Agrawala, 1963 discusses the chronology), consisting of nearly four thousand sūtras, called the *Aṣṭādhyāyī,* "The [Work in] Eight Chapters," a generative program expressed in a formally defined language which seeks to provide an exhaustive formal description of both the language as spoken in Pāṇini's time and the archaic vedic dialect.

A number of technical devices are used to achieve the formal economy of the work. We may conveniently begin with two ways the alphabet (without insisting on the precision of this term) was used. First of all we find a table or array organized on phonetic principles which was developed by the vedic phoneticians. The array is complete and symmetrical for the consonantal stops and nasals as follows:

	voiceless		voiced		nasal
guttural	k	kh	g	gh	ṅ
palatal	c	ch	j	jh	ñ
retroflex	ṭ	ṭh	ḍ	ḍh	ṇ
dental	t	th	d	dh	n
labial	p	ph	b	bh	m

It is of interest to note that the use of this table led to its being filled out in all places, since the palatal nasal is a predictable allophone in Sanskrit and need not be accorded the status of a phoneme (Emeneau, 1946). In Pāṇini's grammar each row is named after its first entry with the word "varga/group," usually shortened to "u" from the "v" in "varga," suffixed. The name of the five phonemes/letters of the first row is "ku," of the second "cu" ("c" is pronounced as "ch" in "church"), etc. Preceded by the vowels and followed by semivowels and sibilants (ordered in the same principles) this array is also the basis for alphabetic order for the indoaryan language group and others influenced by it. Thus in the native Indian writing systems there is a good correspondence between phoneme and letter, since one and only one sign represents each position in the array (which we cannot easily do with the Roman alphabet). Whether we call the native scripts syllabic (disparagingly with Havelock, 1976, p. 28) or alphabetic, they in fact provide spelling which is phonetically unambiguous.

The other use of the alphabet was as a list ordered in a different way arranged in fourteen groups each terminated by a letter which was by definition not part of the

list: a i u ṇ, ṛ ḷ k, e o ṅ, ai au c, h y v r ṭ, l ṇ, ñ m ṅ ṇ n m, jh bh ñ, gh ḍh dh ṣ, j b g ḍ d ś, kh ph ch ṭh th c ṭ t v, k p y, ś ṣ s r, h l. This list is used to form abbreviations for groups of phonemes used in the grammar. A term made from any nonterminal letter in the list and any subsequent terminator denotes that letter and all others up to the terminator excluding any terminators occurring in between and excluding short a used for pronunciation where necessary (i.e., between each consonant). Thus "ik" is the name of the vowels i, u, ṛ, and ḷ; "ac" for all vowels; "hal" for all consonants (where the a is by definition not part of the list); or "al" for the whole alphabet. Some forty-two such abbreviations are used. Similar terminal markers are used on suffixes and verbal roots to indicate scope of application or phonetic changes made to the derived form.

An example of a sūtra (VI, 1, 77), which is usually used to introduce the system, describes one of the basic instances of samdhi mentioned above — the change of certain vowels to semivowels when followed by another vowel in order to avoid hiatus between two vowels. The sūtra reads: iko yaṇ aci. It consists entirely of abbreviations made from the list above inflected according to rules expressed in other sutras and means: A semivowel y, v, r, l replaces respectively a short or long vowel i, u, ṛ, ḷ which is followed by another vowel. A literal translation might be: "There is yaṇ of ik when ac [follows]."

Not all sūtras are as artificial and compact as this one. Some consist of lists of inflectional suffixes or even of words to be treated alike. Definitions and procedures are stated in sūtras. General principles of syntax are stated, in a system which is in itself pleasantly elegant. Usually, especially in the morphological processes, several sūtras must be applied — perhaps fifteen or more — to produce the final form.

Another technical device used to achieve maximum economy of terms was the practice of dittoing parts of rules by stating the common phrase in one sūtra which was to be understood in several subsequent sūtras, originally indicated by accent or nasalization. Note that the use of this technique involves an organizational principle, for sūtras may be grouped to take advantage of dittoing at the expense of their organization by topic.

Though for the greater part of the work the rules are not really sequential (so that a form produced by a given rule may be next operated on by a rule appearing earlier in the grammar) the order of rules is significant for their function. In general, a subsequent rule takes precedence over an earlier rule if conditions are such that either could apply. The problem of interpreting this principle led to the identification of a hierarchy of rules. The final section of the work, devoted primarily to accent and the final phases of saṁdhi, is arranged in strict sequence of application so the product of some operation cannot be used as input for a prior rule. You pass out of the grammar down to a one-way street, an impression which is reinforced by the final sūtra stating that the homogeneity between a and ā which has been assumed in the grammar is no longer in effect in the real world.

The overall organization is complicated. Pāṇini seems to take things in sequence, beginning with his meta-rules, introducing verbs and verbal syntax, proceeding to nominal forms, then treating all kinds of suffixes — inflectional and derivational — together in a large section, and finally turning to the steps of accent and saṁdhi necessary to get the output string properly formed. This organizational structure is easily lost sight of in the details of the system.

The sūtras are supplemented by lists of words read with indicatory terminators in prescribed order. Some lists, such as the verbal roots, are meant to be exhaustive, and in fact this list contains more roots than are found in the literature. Another list contains words which are not regularly derivable, so that taken together with the roots it provides the grammar with a lexicon (since all words derivable from roots were described by sūtra rules).

It was standard practice for pupils to memorize Pāṇini's sūtras when they began their studies, only later having them explained. It is virtually impossible to apply the system unless one knows all the rules, since in the greater part of the work considerable jumping around is necessary. The four thousand sūtras of the *Aṣṭādhyāyī* are supplemented by about eight thousand "corrections" by a subsequent grammarian in the same general style. Nearly half of the sūtras and their supplements are commented on in sturdy, spare prose, written in dialogue form for the most part, by the grammarian Patañjali from the middle of the second century B.C. A good grammarian learned and still learns today all three works by heart, directly from a teacher without the use of a manuscript or book.

Though the practices described here are common and typical, it must be realized that they are not universal. For example, the attitude of the Buddhists and Jains to writing differed in many respects. Though they also held that the ideal was to memorize their scriptures, the act of copying a manuscript (even those of heretics) could be counted as a good deed.

The vedic mantras almost certainly were oral compositions. However it seems at least possible that their redaction involved the use of writing. But the brāhmaṇas must have been for the most part oral compositions, though they presuppose the existence of the saṁhitās. How long would oral composition continue after the appearance of writing? In India, I would tentatively suggest that literature eliminates most of the basic features of oral composition by the first century A.D. (with the appearance of elegantly elaborate verse), but it is still far removed stylistically from what we think of as literate practice today. It is at least five and perhaps closer to seven or eight centuries more before a sophisticated prose style becomes common. Such generaliza-

tions are extremely hazardous with respect to this literature, because every field — indeed it often seems every major work — develops its own individual style and vocabulary, which must partly be due to the great temporal and geographic span of the works. One of the attractions of Sanskrit literature for the study of the early history of literacy is that a single language with a continuous cultural tradition is used over such a long period of time, but it must be remembered that this situation in turn causes other problems.

A theory of literacy is faced with the task of explaining this situation. If writing was unknown when this process of organization — the redaction of the vedic literature — was first undertaken, then we cannot say that listing, formulating and tabulating are consequences or even implications of literacy. (This is not to claim that writing was not employed in these processes when it became available.) But if writing is demonstrated to be necessary to this organizing activity, then we cannot at the same time hold it to be a general rule that literacy displaces oral techniques. It seems a mistake to ask whether listing, tabulating, and formulating are literate or oral mnemonic techniques. Simple lists and formulas occur frequently in oral literature. They are also found in much more complex and sophisticated forms in written literature. And we see that in India at least they continued to be learned orally long after writing was available to preserve them. Rather we must seek to understand the relation between these phenomena.

A general methodological question thus emerges: which is the better presumption: (1) that writing may be assumed to be in use wherever it provides the simplest explanation of some artifact; (2) or that writing is to be admitted into a culture's repertoire of conceptual devices, its cognitive toolkit, only when incontrovertible direct evidence for its use exists? The answer to this question is a matter of determining the distinction between writing as a necessary and as a sufficient condition for some given activity. Thus for all the examples of early literature presented here, writing is clearly a sufficient condition. But at what point are we justified in the assumption that writing is a necessary condition for some activity? We need, it seems, to gather data from more sources, perhaps in greater detail, in order to formulate questions and in the process clarify some assumptions and procedures. Can the *Sāmaveda* have been arranged as it is without the use of writing? Is it possible to compose the prātiśākhyas without writing? What about Pāṇini's system? If used, is it possible to identify different uses for it? What roles does writing fulfill in different situations and how can they be identified? What conditions constitute sufficient grounds for accepting an oral tradition as intact? What are the implications of relying on a written text to study an oral tradition, whether that text be autochthonous or ethnographic? Should we assume that any literature that does

not display oral characteristics is a literate production? Are we to accept the claims of oral transmission attached to some literary work even if we find evidence of manuscripts? And what are sufficient criteria to decide any of these questions?

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The Social Interaction Origins of Narrative Skills

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Recent research shows that children under the age of 6 have trouble narrating a story to an adult even when the story is familiar to the child (Newman, Dowley, & Pratt, 1978; Dowley & Sulzby, 1978; Brown & Smiley, 1977). When asked to retell a story, children of 4, 5, or 6 will often seem to have little confidence that this is in fact a task that they can do. They will respond to an adult's request "Tell me the story of..." with "I forgot" or "I don't know it." Some children say that they do not know where to begin, or once they get started, they will say "I forgot" indicating that they do not know what comes next. Sometimes they remember scattered details from the story but are not able to recount the connections between characters and events. Sometimes they will get involved in relating the details of one episode and then lose sight of the overall story and not know how to tie back into the main story line.

I first noticed such responses from children while carrying out a study exploring how young children understand episodes of Bert and Ernie from *Sesame Street* (Newman, Dowley, & Pratt, 1978). In this study we used the task of narrative recall of the story as one way of tapping the children's comprehension of the social interaction between these two characters. We expected that children from 4 years old on would simply be able to give a narrative rendition of what they had seen on TV after viewing the skit twice. But this was not so for the younger children of the sample. As a listener I had to provide ample encouragement to get them started, and then when the children kept stopping, unable to go on, I found myself asking questions such as "What happened next?" and "What did Bert say then?" I tried to minimize my questions and intervention as much as possible for we wanted to see what the children knew about the story. However, when we analyzed the data it was difficult to tell what the children "knew" because, instead of having an uninterrupted narrative protocol from each child, we had stories that could be more aptly described as conversations between the adult listener and the child. The adult listener had become an active participant in the story telling process. Initially we thought that by separating out the adult's utterances and questions we would be able to see what each child could do on his or her own. But this was impossible because in taking away the adult listener's utterances we were left with disconnected fragments of a conversation.

The Bert and Ernie data were confusing for a long time. I was sure that the children understood something about Bert and Ernie but we did not know how to structure a situation and a task that would enable them to show us what they knew and understood. Since teachers, reading specialists, and researchers are often asking children to give a narrative account of a story that they have heard or read as a way of assessing their comprehension of the ideas presented, it becomes important to understand how this ability to narrate a story develops.

To investigate this question further, I began observing a kindergarten teacher and her children. The children were 4 to 6 years old — the same age as the youngest children in the Bert and Ernie study. This teacher spent a good deal of time getting the children to narrate stories back to her as part of the daily program of listening to and dramatizing stories. In dramatizing stories, each child takes the role of a character and acts out the part while saying that character's lines. Even with stories that the children knew well, such as "The Three Pigs," the children had trouble at times remembering certain parts, remembering what came next, and remembering the words that went with their part, and the teacher played a central role in directing the action of the story dramatizations. The teacher began asking the children, individually, to narrate stories to her in order to give each child time to think about the story, each character's part in it, and how the parts fit together.

I tape-recorded this teacher's efforts to get the children to retell stories and fairy tales that they had heard several times in the classroom. I began to observe the familiar reactions that I had seen with the children retelling Bert and Ernie stories. The children had all ranges of difficulty with the task. I heard this teacher asking the same kinds of questions and giving the same kinds of encouragement that I unwittingly found myself asking while eliciting the Bert and Ernie story, for example, "What happened next?", "Where did she go then?", "What happened in the end?"

The more I observed this teacher-child interaction of story retelling, the more it seemed that the adult was helping the child to understand something about the particular story being told *and* the task of narrative recounting itself. It seemed that the children were developing simultaneously both an understanding of the goal of the task implicit in the request "Tell me the story of..." and an understanding of the events and actions. This process of learning seemed inextricably tied to a social interaction.

The fundamental hypothesis being explored in the research reported here is that children's understanding of a particular story *and* their understanding of the particular task being used to tap their understanding of it emerge first in social interaction. I propose that the analysis of a child's development of narrative skills must begin with an analysis of what the child learns in story-

telling interactions while receiving support and guidance from the adult listener.

Theoretical Background

Vygotsky's theory of development (1978) provides an important framework for our analysis because he held that the development of the child begins in social interaction, that is, he saw the higher mental processes as originating in a social relation between two people. Vygotsky was interested in how children get to the point of being able to guide and direct their own actions in solving a problem or completing a task, and he held that the skills and processes of thinking that children acquire are directly related to how they interact with adults and peers in specific problem-solving situations. Vygotsky argued that children arrive at the point where they can complete tasks on their own because at some point in the past they received help and guidance from another. Children internalize the kind of help they receive from others and eventually come to use the same means of guidance to direct themselves. In a sense they "act out" the appropriate behaviors necessary to complete a task under someone else's direction and only later begin to understand the significance of each behavior as it relates to the overall task they are working on.

In using this approach to study the development of a child's memory, attention, or verbal skills, one does not look for the origins of these processes inside the child but, rather, (a) one looks outside the child at the external and observable behavior (both verbal and nonverbal) that others engage in as they help a child, and (b) one looks for evidence of how this help is providing the foundations of self-direction.

According to Vygotsky, there are two levels of development: the actual and the potential. The child's actual level of development consists of those mental processes that are matured to the point of being regulated by one's own means. It is manifested in those situations where a child can complete a task independently of another's direction. A child's potential level of development consists of those mental processes that are not fully matured but are in the process of unfolding. It is manifested as a child solves a problem with the help of an adult or more capable peer. A child's potential can be assessed by observing the extent to which a child makes use of help offered by another in a problem solving situation. Vygotsky used the term "zone of proximal development" to define this second level, the area within which a child can learn if help is received from others.

Vygotsky never specified what kinds of social interactions would foster a child's development toward independent functioning nor did he describe what transpires in any one social interaction that leads to a child's growth. There are several forms of adult-child interaction that one might think of as a teaching-learning situation, for example, demonstrations or didactic teaching. There is another less direct and less conscious way that adults teach children in their day-to-day encounters as the adult and child work on the carrying through of a task together. The research of Wertsch et al. (in press) and Wood, Wood, and Middleton (1978) investigates how mothers and other adults help children complete tasks in an effort to document this more common daily occurrence of informal learning. The kindergarten teacher I observed was using this more indirect and informal method of guiding the children through the narrating and dramatizing activities.

Retelling stories is not something that we learn to do by someone formally teaching us. Usually no one tells a child what steps to take to narrate a set of events, yet we can all think of times when adults say to children: "What did you do in school today?" or "What did you see at the movies?" or "What was the story about that you watched on TV last night?" When our first question does not elicit very much we might say "Well who was in the story?", "What happened?", "Where did they go?" What we do with our questions is verbalize for the child the very questions we would put to ourselves if we were trying to recount a set of events.

On reexamining my interactions with the children in the Bert and Ernie study and this kindergarten teacher's interactions with 4 to 6 year olds, it became clear that the methodology for studying how an adult guides and directs a child in narrative reporting and how a child benefits from this guidance was all there in the procedures in both cases. The methodology can be summarized: have an adult present a child with a task that is a little too difficult for the child to complete independently, see how the responsibilities for carrying out the task are distributed, observe the means by which the adult guides and directs the child in carrying out the task (in the case of narrative reporting, the help is verbal), and see how the child responds to the adult's questions and comments, for it is the child's response that is the best evidence for how much 'help' the child received from the adult's efforts.

When an adult and child are retelling a story together, there are many ways that the responsibilities for completing the task can be divided up. At one extreme, there is the case where the adult may have to carry out almost every aspect of the narrative task alone because the child does not understand what the goal or outcome is that they are working toward, and therefore does not understand the steps necessary to take to complete the task. In these situations, one finds that the adult asks the child questions such as "How does the story begin?" "Who was in the story?" in order to try to involve the child and guide the child through the task. When the child cannot respond, the adult ends up answering his/her own questions by providing the information, usually in the form of a tag question: "Bert and Ernie were in the story, weren't they? What did Bert have?" When the child does not respond, the adult might say "He had a cookie, didn't he?" In this way, the adult would be carrying

through the task in dialogue with himself/herself when efforts to carry out the task in dialogue with the child failed. At the other extreme, there is the situation where the story and task are so clearly understood by the child that he/she can retell it with no guidance or direction from the adult at all. In this situation, the adult is an interested but quiet listener.

An overview of the developmental process that I am hypothesizing to account for how children acquire narrative skills can be stated as follows: The adult does not teach the child how to narrate a story by directly explaining or instructing the child on how to carry out the task; rather the adult "teaches" by leading the child through the task. The child "learns" by gradually becoming aware of why he or she was being asked certain questions.

How does the child gain this awareness of the significance of the adult's questions? To phrase the question in light of Vygotsky's theory we would have to ask: how does this transition from functioning in social interaction to independent functioning happen? First, in order for the transition to take place the story retelling task must be within the child's potential understanding. Given an appropriate story, the second most important fact affecting the transition is the adult's role. In order for there to be a transition from being guided by another to being guided by one's own means, the one doing the guiding must allow the child to take over responsibility in carrying out the task when he/she is ready to do so. The adult must be sensitive to the needs of the child and not simply step in and do everything, nor offer help at a level too vague and distant to the child's needs.

The basic hypothesis here is that the transition to independent functioning occurs because the adult, through questions, is continually guiding and encouraging the child to reach, and the child is continually having to work to make sense out of the adult's questions. The adult makes demands of the child that are just beyond the child's grasp, and the child then struggles to find coherence in what the adult is saying. If the adult didn't make demands that were a little too difficult for the child, or if the adult simply did everything for the child, there would be no struggle for coherence on the child's part. On the other hand, if the adult is confusing or talks way above the child's head, or asks him or her to retell a story that is way too difficult, then there is no possibility for transition. The adult's talking would be meaningless and beyond the child's current potential.

The following case study provides an example of this phenomenon of children telling stories in dialogue with another person. We will examine this interaction in light of Vygotsky's theory of learning within the zone of proximal development and attempt to describe effective adult interventions within the zone. We will look for evidence of a transition from carrying out the task with the help of another to carrying it out more independently, and try to characterize those features of the adult's role that aid the child in this transition.

Case Study

In the following interaction, a 5-year-old child, Karen, is retelling *The Five Chinese Brothers* (by C. Bishop and K. Weise) with her kindergarten teacher. In this story there are five brothers who look exactly alike, and each of them has a special quality: the first can swallow the sea, the second has an iron neck, the third can stretch his legs, the fourth cannot be burned, and the fifth can hold his breath indefinitely. In the story, the first brother is falsely accused of drowning a little boy and is condemned to have his head cut off. On his execution day, he requests permission to say farewell to his mother. The judge says, "It's only fair," so he goes home and the second brother with the iron neck comes back. When he cannot be killed, another punishment is assigned: that he should be drowned. The story continues with each brother returning home to say farewell to his mother and with another brother returning — the brother with the special quality to overcome the designated punishment. In the end, the people decide the brother must be innocent and they let him go home.

The children in this classroom had many experiences with this story. The teacher had read it to them several times, they had heard it on a story record at rest time, and they had acted it out in small groups under the teacher's guidance. This was Karen's first time narrating this particular story, but she had narrated many other stories to the teacher before this. The teacher taped this interaction, transcribed it, and added the comments that appear in parentheses.

> Karen (5 years old) retells the story of *The Five Chinese Brothers* to her kindergarten teacher. (Karen has just heard the story 5 minutes ago with the rest of the class.)
>
> 1. Teacher: Tell me the story of *The Five Chinese Brothers.*
> 2. Karen: I don't know this.
> 3. T: What could the first Chinese brother do?
> 4. K: I forgot.
> 5. T: Remember he went fishing?
> 6.   How did he find all the fish?
> 7. K: He drink the water.
> 8. T: Right.
> 9.   Now what could the second one do?
> 10. K: I forgot.
> 11. T: Oh remember they tried to cut his head off?
> 12. K: That's the one with the iron neck.
> 13. T: And the next brother....
> 14. K: could stretch and stretch.
> 15. T: Karen, you do remember!
> 16.   You thought you didn't but you do.
> 17. K: (her face lights up) I thought I didn't but I do.
> 18. T: Now how 'bout the fourth.
> 19. K: (silence)
> 20. T: Remember they tried to burn him?
> 21. K: Oh that's the one who couldn't be burned.
> 22. T: Now the last one, the fifth one.

23. K: The mother.
24. T: Remember the brother they put in the oven so he couldn't breathe?
25. K: Then he could hold his breath?
26. T: Right.
27. Forever.
28. What happened when the first Chinese brother went fishing?
29. What happened?
30. K. He drank the water.
31. T: Then what?
32. K: The boy came?
33. T: See you do remember!
34. K: He said "can I go fishing?"
35. He kept begging.
36. "OK, I'm going to make a sign for you to come back."
37. Then he drank the water.
38. He made a sign for his hands to come back.
39. And the boy only made faces.
40. T: What a nasty boy.
41. K: He thought he was going to burp
42. and all the water came out
43. and the boy disappeared.
44. T: So then what happened?
45. K: He had to go to the judge.
46. T: Yeah
47. K: "Can you only to say my mother goodby?"*
48. "It's only fair."
49. And the second Chinese brother came back to his place.
50. That was the one, that was the one that had the iron neck.
51. T: So what happened with the one with the iron neck?
52. K: They tried to cut his head off.
53. T: Were they able to do it? (laughing)
54. K: (laughing) No.
55. Or he could go to the judge.
56. And the judge said ... oh no, *I know* this.
57. The Chinese brother said "Do you only to bid my mother goodby?"
58. and he said its only fair.
59. So the four Chinese brother came back to his place.
60. That was the one who could stretch and stretch and stetch.
61. (Karen's face is lit up, eyes shining) They tried to throw him in the water.
62. but he was ordered to go to the judge
63. and the judge said ... I mean the Chinese brother said "Do you own me to bid my mother goodby?
64. "It is only fair."
65. And the fifth Chinese brother came back to his place.
66. That's the one that ... that was the one that ... I'm talking about the fifth.

67. That was the one can be burned.
68. They tried to burn him
69. but he was ordered to go to the judge.
70. The Chinese brother said "Do you owe me to bid my mother goodby?"
71. She said "it's only fair."
72. What comes after the fifth?
73. T: Now let's see, they couldn't cut his head off, they couldn't drown him, they couldn't burn him,
74. so finally what did they try to do?
75. K: They stuck him in the fire?
76. He couldn't be fired?
77. So he was ordered to go to the judge.
78. And the Chinese brother said, "Do you owe me to bid my mother goodby?"
79. She said "it's only fair"
80. and that's all.
81. Does something else?
82. T: So they couldn't drown or burn or cut off his head.
83. Remember the oven?
84. K: Oh yeah.
85. They put him in the oven.
86. It was filled with fire.
87. So they tried to get rid of him.
88. That's all.
89. T: Did they get rid of him?
90. K: Oh no, I know they couldn't! (she laughs, obviously pleased with herself)

The teacher begins with the request: "Tell me the story of *The Five Chinese Brothers.*" Immediately we see a common response from a child of this age — the child's uncertainty and lack of confidence that this is a task she can do. On line 2 she answers "I don't know this," on line 4 and 10, "I forgot," and on line 19, no response. On the other hand, we see the teacher not swayed by Karen's doubts. She moves right along to show Karen where she must begin — by identifying each character, and on line 3, she asks "What could the first Chinese brother do?" When Karen cannot respond, the teacher goes right along and answers her own question by filling in the necessary information for the child on line 5: "Remember he went fishing?" In line 6 the teacher begins an interesting strategy of providing help to Karen. She asks questions that supply information about what the brother does or what the people try to do to him and this in turn reminds Karen of the brother's special quality to help him overcome the difficulty. This happens in the teacher-child exchanges on lines 6 and 7, 11 and 12, 20 and 21, and 24 and 25. Each time however, the teacher first gives Karen the chance to identify the brothers on her own (lines 9, 13, 18 and 22). When Karen cannot remember anything about the brother the teacher then gives her a clue — his punishment.

Karen was able to identify the third brother on her own (line 14) which leads the teacher to remark excitedly: "Karen, you do remember? You thought you didn't but you do." Karen's face lights up and she

*In the original text, each Chinese brother says to the judge: "Your Honor, will you allow me to go and bid my mother good-bye?"

responds, "I thought I didn't but I do." This exchange marks a turning point in this story retelling interaction. Karen stops saying "I forgot" and tentatively begins to trust her memory. In lines 20 to 27 Karen identifies the fourth and fifth brother with help from the teacher.

In lines 27 and 28 the teacher launches Karen into the first episode of the story: "What happened when the first Chinese brother went fishing?" Karen gives one detail: "He drank the water." The teacher asks another question to lead to the next detail, Karen ventures a response and the teacher again shows Karen her excitement and confidence in her: "See you do remember!" (line 33). This remark seems to mark another turning point in the interaction as the exchange on lines 15, 16, and 17 did. We can see the effect of this encouragement on Karen because she then goes right into recounting the events of the first episode (lines 34 to 43) without needing help from the teacher to link individual events.

On line 43, Karen gets to the end of the first episode and stops. The teacher is right there to help link the first episode with the next one. Karen is then able to recount the second episode in lines 45 to 50 without help from the teacher. At the end of the second episode on line 51, Karen again stops and the teacher's question leads her into the next episode.

We can hear Karen's growing confidence in herself when on line 56 she says "...oh no, I *know* this." She proceeds to tell the bulk of the story on her own in lines 54 to 72. Her retelling is not entirely smooth and coherent; some details are left out and the retelling seems choppy, for example, in lines 65 to 69. Karen is somewhat aware of this and one time she tries to clarify herself by saying: "I'm talking about the fifth." To make such a comment shows us that she is monitoring her own narration and trying to make her communication clear to her listener.

On line 72, we see a striking change from the earlier exchanges with the teacher. This time, Karen stops and *she* asks the question. This time Karen is seeking help when she feels she needs it as opposed to coming to a stopping point and not knowing what help to ask for. At this point, the teacher recapitulates for Karen the actions she has recalled so far (line 73) and then asks the question "So what do they finally do?" leaving it up to Karen to remember the final punishment. Karen cannot quite remember and she repeats herself. She stops and again she asks the teacher if something else happens. The teacher again reminds Karen of the three punishments that had been overcome and then she gives a clue in utterance 83: "Remember the oven?" and this reminds Karen of the end of the story.

DISCUSSION

This transcript illustrates how a child can carry out the task of recalling a story in dialogue with an adult. The task situation is set up as something the teacher expects Karen to be able to do on her own, but when Karen has difficulty, the teacher is right there to help.

There is a noticeable change over the course of the interaction in how much help Karen needs from the teacher. There is a clear progression from needing a great deal of guidance and direction from the teacher in the beginning to needing less and less as she goes along. One might have inferred after the first 30 exchanges between the teacher and Karen that Karen did not know the story well despite the different experiences she had had with it in the classroom over a number of weeks. But what we see happening is the teacher working with her in her "zone of proximal development." We see the teacher retelling the story with Karen, providing encouragement, praise, and specific story material as the child needs it, and being able to step back and let Karen work on her own when she is able and ready to do so.

What could account for this change in the story retelling interaction? How does the transition from carrying out the task with help from the teacher to carrying it out more independently occur? The transition from being guided by another to being self-directed is a gradual process taking place over a long period of time. A child does not suddenly reach his or her potential in any one interaction with another. But there are two factors which determine whether there will be a transition at all from being other-directed to self-directed. They are the level and difficulty of the task, and the adult's role. In this case, the task of retelling *The Five Chinese Brothers* was within the child's reach. The story was not so easy as to be at her actual level of development (where she could have completed the task without help), and it was not so hard as to be completely beyond her. The demands Karen's teacher made of her were not unreasonable, and we know this because Karen was able to respond to the questions.

How does the teacher facilitate the transition for Karen? One can say that the teacher shifted the level of help she provided to the level of the child's needs. But what does this mean? What kind of help is she providing and how does it change to meet the child's level of need? As we look at the story retelling we can see that the teacher's "help" comes in the form of different kinds of probe questions (e.g., "What could the first Chinese brother do?", "So then what happened?"). But in order to describe how these questions function as a form of help to the child, we must look at the child's response to the questions because it is the child's response that tells us what meaning they have for him or her. On line 29 the teacher asks "What happened?" and Karen responds with one detail: "He drank the water." The teacher follows this with another wh- question: "Then what?" Karen again responds with one detail: "The boy came?" On line 44, the teacher asks another non-specific wh-question ("So then what happened?") but this time Karen responds by recounting the events of the second episode in lines 45 to 50. What is important to note here is that the same probe can have a different meaning for

the child at different points in the task. Probes do not function in the same way for a child every time they are used. The amount of help a child receives from the adult's question can be seen by how much "mileage" a child gets out of any one question. The child's response to the probe becomes the best measure of the probe's function and effectiveness as a form of help.

In this particular story-retelling interaction, Karen does not get very far in the beginning when the teacher makes requests such as "Tell me the story of *The Five Chinese Brothers*" or "What could the first Chinese brother do." The child's responses (lines 2 and 4) indicate that the help offered was ineffective. When the teacher saw that her questions failed to get Karen started, she made her questions more specific (e.g., "Remember he went fishing? How did he find all the fish?"). What seems to happen each time the teacher intervenes when the child has difficulty is that the teacher provides minimal help at first (e.g., "What happened?") assuming that Karen will be able to pick up from where she was and keep going. When the first question is not helpful, the teacher offers more help in the form of more specific questions *but only* after the child demonstrated a need for additional help (i.e., by not continuing). The most that the teacher does at any one time is provide a single event in the story. In the latter parts of the story retelling, the child is getting much more "mileage" out of the teacher's questions as indicated by her extensive recounting of episodes without the support of specific questions from the teacher.

From this interaction we can see a pattern in the teacher's questioning strategy. The teacher asks a broad question, slightly beyond the child's grasp, and then gradually in successive steps, reduces the demands of the task when the child continues to have difficulty. In this way, the teacher's questions continually stretch the child to do as much as she can on her own. It is this challenge, I suggest, that provides the child with the incentive to develop. The teacher keeps the situation in that delicate balance of not being too hard and not too easy. Wood et al. (1978) describe the process of effective instruction in just this way:

> [It] consists in continually confronting the child with problems of controlled complexity, setting goals or making requests which lay beyond the child's current level of attainment but not so far beyond that he is unable to 'unpack' or comprehend the suggestion or instruction being made. (p. 132)

It is the sequence of the teacher's questions (broad and nonspecific to more and more specific as they are needed) that make the story retelling task one of "controlled complexity" for Karen where she is challenged each time to go beyond those skills she already has mastered and reach toward realizing her potential.

CONCLUSION

The attempt here has been to describe what learning in social interaction can look like and how an adult can provide help in such a way as to foster a child's growth in his or her "zone of proximal development." In examining successive story retelling interactions using the same and different stories, one does not find that a child has only one kind of problem in carrying out the task, e.g., trouble remembering how the story starts, trouble linking episodes, trouble linking the events within an episode. One finds that a child can have momentary problems with any aspect of the task of communicating to a listener or with the story material itself. One can then see the teacher structure the social situation of story retelling to accomplish what the child will eventually come to do on his or her own. What I hope to explore in future analyses is how children's understanding of the task of story retelling, the communicative situation between themselves and a listener, and their understanding of the story itself are functionally related to the kind of help an adult once provided in social interaction.

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An Approach to the Study of Children's Role Play*

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An objective of this article is to present some features of the pretend enactment of Mother, the original social role. It is the first role to be fluently enacted and perhaps the first to be conceptually elaborated. Social knowledge is manifested in role play, which is defined here as the adoption of an identity other than the self. Pretend enactment is defined here as the behavioral representation of the adopted identity. Like all social performances, it is subject to interpersonal and situational influences.

A child's concept of Mother includes the concept of Baby and is best realized in action with Baby; thus a dyadic play situation will be the focus of discussion. Since play is freely chosen, self-motivated and self-directed, no adults were included in the interaction situation and no specific instructions or suggestions were offered to the children.

In order to understand the phenomenon of spontaneous, interactive role play, it will be necessary to distinguish three aspects of a child's behavior. These are the relational role enactment, which is conducted vis-à-vis the pretend role complement, e.g., Mother plays her part in relation to Baby (or Husband); Father plays his in relation to Baby (or Wife); the situated peer behavior of the partners as each elicits and supports age- and sex-appropriate responses; and the capabilities and preferences brought by the individual child to the situation. The thrust of the argument will be that the three aspects can be discriminated by use of a contrastive methodology of observation. Previous investigations of role play have studied one or, at most, two of these aspects. None, to my knowledge, has linked all three. Further, multiple measures and diverse levels of analysis are recommended to index the three aspects.

A current concern of developmental psychology is that of the relationship between social cognition (especially role taking) and social behavior. Rubin (in press) has argued that social pretend play necessarily reflects perspective taking. Adopting the role of another (and accepting a partner in an adopted role) can be seen as evidence of the cognitive processes of decentration and of the operations of reversibility and conservation of identity — in this case, of person identity. The child becomes Mother, and the partner becomes Baby within the agreed-upon pretend frame. The pretend frame is temporary, bounded, and revocable. It can be broken by bilateral or unilateral decision and the nonpretend identities resumed or other pretend identities adopted.

A more convincing argument for the significance of role play as indicative of perspective-taking processes is, I believe, the evidence that role adoption and enactment are influenced simultaneously by the partner's role and role enactment behavior, by the partner's identity and behavior, and by the personal ability and style of the individual.

Another type of significance for role play is the knowledge of role attributes, role relationships, and role-appropriate actions displayed in enactments. With few exceptions, the understanding of everyday social procedures and their distribution by person which was pointed out by Sacks (1972) in his study of a child's simple story ("The baby cried. The mommy picked it up.") has not been pursued by developmentalists. Perhaps, in order to credit the young child's story or role enactment as reflecting achieved knowledge, rather than as imitation, it is necessary to accept that the play behavior is generated from cognitive representation of the role together with its consonant acts, attitudes, rights, and obligations. It may also be necessary to see that the child has behavioral alternatives for the role performance. Although discovery of an iron may regularly trigger ironing activity using available or imaginary clothes, other activities should be adduced to the role that appear to have no immediate material association or support, e.g., naming another child Baby and then tidying her up to take her to Sunday school.

The analyses of Mother-Baby role play will examine the relational role aspect, the partner interaction aspect, and the individual aspect of one target child. The analyses will only sample from classes of measures that have potential for tapping the relative influence of the three aspects. The observations reported derive from a videotaped corpus of 48 nursery school children. Three children from the same class were brought by their teacher to the laboratory at one time. Each child was paired with the two different, same-aged partners, so that each child interacted with one same- and one cross-sex partner. Each dyad was observed through one-way mirrors, for a total of 30 minutes for each child. The room was furnished with carpet, couch, stool, table, curtains, and pictures. Both domestic (stove, ironing board, cradle) and nondomestic (large car, small trucks, blocks, stuffed animals) toys were available. The pairs were invited to enter the room to play, see what they could find, or do whatever they liked. Then they were left alone. Using this corpus, Garvey and Berndt (1977) distinguished four types of roles for the purpose of describing pretend activities. Functional roles are those organized by an object or activity, e.g., being the driver of the car, or the one who cooks and serves dinner. Relational roles are the family roles that imply their role complements, e.g., mother-child, wife-husband. Char-

acter roles are either stereotypic (based on occupation or habitual activity, e.g., fireman, witch) or fictional (characters with proper names, e.g., Hansel and Gretel, Batman). Finally, there are peripheral roles, which are discussed but not enacted, e.g., real or imaginary friends.

The present target child is a girl (G1) age 3:1. Her partners are a girl (G2) age 3:1 and a boy (B) age 3:3. The target child's first session (I) was with B; her second (II) with G2. Finally, G2 and B were paired in the third session (III). It is in session II that G1 and G2 reciprocally adopt the relational Mother-Baby roles, which will be indicated as G1(M) and G2(Ba).

It is necessary first to describe briefly the three sessions, which will then be contrasted. In session I, G1 and B do not achieve reciprocal role play. G1 engages in several domestic pretend activities; she sweeps, irons, fixes a meal and she repeatedly calls B (using his first name) to come to dinner. She shows him a doll ("Our baby Indian"), which she then feeds. B, however, is playing the fictional role of Superman. He drives his Batbile [sic] and calls Robin and Batman on a telephone. B proposes that G1 (whom he calls by her first name) be Spiderwoman, but she ignores this. G1 does not name herself Mother in this session; she exhibits only functional, albeit elaborated, play. The interaction is agreeable, though. B fetches milk for the baby Indian; G1 fetches telephones and trucks for B on the Batbile and brings him various stuffed animals to take for rides. Each child makes independent phone calls, but explains to the partner who was called and what transpired.

In session II, G1 an G2 briefly explore the room and notice the doll; G2 irons for a moment, makes a telephone call, and offers a second telephone to G1. After 1½ minutes, G1 asks, "Won't you be my baby, okay?" to which G2 responds, "Oh, okay," with some excitement. The pretend frame with the reciprocal roles is established, and for the remainder of the session out-of-role breaks are fleeting and quickly repaired by either G2 or, more often, by G1. Both children frequently mark the roles by calling each other Mommy and Baby. The activities of this session will be elaborated below.

In session III, G2 begins by inviting B to play her role complement: "We're fixing supper. You be the mommy and I'll be the baby, okay?" B refuses. G2 pretends to throw her food on the floor, then tries again: "Mommy, I'm ready to go to the store." B replies, "I'm Superman," and gets on the car, inviting G2 to come along. G2 switches roles, announcing "Mommy's fixing supper. I'm the mommy." She calls B to supper, using his first name, but when he protests, she addresses him as Superman. Subsequently, B must correct her on this point several times. G2 sets a place at supper for an imaginary baby. She then initiates a nonrole game. She repeatedly pretends to cut up a large stuffed snake B is holding. B objects, G2 continues teasingly, then pretends to sew the snake up again. B ends the game by

moving away. G2 announces "It's clean up time" in a teacher-like voice, but B is again Superman and G2 irons, as mommy. B finds utensils in the oven and interrupts G2's ironing, putting pans on the ironing board. G2 throws them off, upsets the board, and exclaims, "Ooh, mommy's so angry!" B, using her first name, says she isn't angry. G2 dresses a doll, but ignores B's offer of a pot for its supper. B investigates the tool belt. As in session I, there is both interaction and independent role play, but the functional, character and relational roles adopted independently do not lead to integrated role play.

Measures for the analysis of role play.

Studies of mother-infant and mother-child interactions, of language acquisition, and of register variation, particularly of Motherese and Baby-talk (e.g., Snow & Ferguson, 1977) suggest a number of features children might use to mark the relational roles of Mother and Baby. Research has suggested that mothers use a distinctive style of speech, or register, in speaking to young children in contrast to older children and to adults. Over time, the style exhibits changes keyed to the relative linguistic and cognitive maturity of the developing child. Higher pitch, for example is addressed to babies than to older children and is presumably more effective in capturing their attention. Shorter utterances are used to a child at the one- to two-word stage than to children who have begun to use longer utterances themselves, and indeed, length of utterance has been frequently used to assess the child's level of linguistic maturity. An hypothesis is that both the child's behavior and the mother's assessment of its level of linguistic comprehension and other cognitive and communicative capabilities influence the form and content of the mother's speech.

For the present objective, features of speech and of other interpersonal behavior are required that would also reflect the differences in reactions to individual partners and differences in each child's personal style which are hypothesized to influence the adoption and execution of the role. Several measures from different classes of behavior will be briefly illustrated. Many of the measures have been used in the study of language acquisition and of the influence of caretaker speech on linguistic development.

Gross output. The relative number of utterances[1] produced by each child distinguishes between the sessions. G1 somewhat exceeded B in session I; G2 equalled B in session III, but G1 greatly exceeded G2 in session II. In respect to length of utterance of words, G1 and B did not differ in session I (5.0 words, respectively). G2 and B were also similar in session III (4.0 and 4.6). In session II, G1 greatly exceeded G2 in this measure (8.3 and 3.2, respectively). In the first 1½ minutes before the Mother-Baby roles were adopted, however, the discrepancies between G1 and G2 on both output measures were less. The children's verbal output seems to be influenced both by partner and, in the case of G1 with G2, by the rela-

tional roles that both enact.

Linguistic maturity. Both complexity of the verb phrase and use of complex, compound, and clause-complement sentence structures index development in language acquisition: G1 is able to produce rather complex sentence constructions, e.g., "Tell me where to stop if you see the grocery store where you want to go." Neither she nor G2 have the problems that B still exhibits with subject-modal inversion in interrogative clauses, e.g., "Why this can't fit on here?" Contrasting the children across the three sessions, however, ranks G2 as the most linguistically immature on the two selected measures in both sessions II and III. Though she uses more complex verb phrases in session III, she avoids multiclause sentences in both sessions. In session I, G1 exceeds B in verb phrase complexity, and he exceeds her in number of multiclause sentence constructions. (B produces a relatively greater number of multiclause sentences in both his sessions than does either of his partners.) In session II, G1 halves her use of complex verb phrases compared with session I, though her use of multiclause sentences is not reduced. Of the complex verb phrases G1 uses in session II, half are addressed to G2(Ba) and half are used when, as Mother, she is talking to herself, e.g., "This keeps falling down. I don't know why it's falling down." From this sample of the children's speech, it appears that the child's level of linguistic maturity influences performance with each partner. The partner's linguistic maturity and the dyad's activity also influence the linguistic performance. And both G1 and G2 reflect the influence of the relational role enactment on these measures.

Pragmatic function and semantic content. Caretakers are known to use a relatively high proportion of questions with young children. The content of questions also varies with the relative status, age, and linguistic maturity of speaker and addressee. Caretakers inquire after younger children's wants and needs, but rarely ask them for factual, or debatable, information. Caretakers inquire about mutually present and perceivable objects and events or those of the immediate past or future when the child first begins to talk, and later extend their inquiries to events and objects more remote from the situated here and now (Sachs, 1977). G1(M), being concerned with nurturant activities and with monitoring and responding to the transitory interests of G2(Ba), conforms to these principles. Her 27 questions in session II concern the immediate physical and attentional needs of G2(Ba). The nine questions asked by G2(Ba) concern the identity or use of objects. Their questions, as Mother and Baby, however, deal with the displaced here and now of the pretend frame and reference the imaginary appurtances of that frame, e.g., Baby's milk, food, Sunday school clothes, and toileting. G1(M) asks "Did you have a bm or peepee? Which one?" after she takes G2(Ba) to the three-legged stool with a magnifying glass in the center which they designate as the potty. G2(Ba)

does not inquire about Mother's needs, desires, or intentions.

In session III, G2 and B each contribute an approximately equal number of questions (nine and seven, respectively), referencing both the actual and the pretend here and now. Each child's questions concern both objects and partner's desires and intentions in approximately equal numbers. In session I, G1, again the leading questioner (23 questions), does ask about actual objects and events but favors inquiries about pretend objects and events and about B's desires and intentions. B asks only nine questions of G1 and seven of them concern actual objects. G1 also asks B for his opinion about the setting ("They got a nice room, don't they?") and about absent, but actual, children at the nursery school ("The other kids wanted to come here, didn't they?")

The pattern of results is similar to that of the other measures. B is a moderate questioner and primarily attends to objects (if questions reflect the questioner's attention), but with G2 (who acknowledges his Superman role) he can also attend to his partner's intentions and desires. G2 is also a moderate questioner. With B as partner, she attends to both objects and partner intention. With G1 she questions only in Baby role and restricts her attention to the objects of the pretend frame. G1 is an inveterate inquirer, interested in both her partner's plans and needs, but she selects the topics for the questions according to individual partners, their joint activities, and the partner's presumed ability to respond.

Discourse measures. Not only do caretakers ask questions, they also respond to them. In session I, G1 fails to respond to seven of B's nine questions and he responds to only half of hers. In session III, G2 and B each fail to respond to about half of each other's questions. In session II, G1(M) responds to all of G2(Ba)'s questions. Before G1 and G2 adopt the roles in session II, G2 asks no questions and responds to three of G1's seven. As Baby, G2 answers four of the maternal questions, each time with only "Yeah" or "No."

As a discourse partner G1 shows skill in sustaining conversation by questioning on partner-introduced topics; e.g.,

B: I got my poor Teddy Bear.
G1: Is he sick?
B: No.
G1: Well, what's the matter with him, then?
B: He's too tired to...(fades out)

This is a skill which she exercises as Mother in Session II, though in that role with G2 she must more often answer her own questions and otherwise fill in the conversational gaps. These are also characteristics of Motherese. This example illustrates another tendency that G1 exhibits in both her sessions: she selects as conversational topics the moment-by-moment verbal or nonverbal focus of attention of her partner. B and G2, both individually and in their dyadic sessions, primarily select

self-generated topics.

Children of this age show a tendency toward self-repetition unpunctuated by alternating partner speech and such self-repetition is also common in Motherese. I distinguish two types. One is repetition or paraphrase of messages emitted in a burst, with no intervening pause and often without fully terminal intonation; these are called runs. The other type is interspersed with pauses exceeding one second, time in which a partner could respond, and each repetition is produced with terminal intonation. If the speaker appears to expect a partner response, the second type is called a notice-missing-response (NMR) sequence (Garvey & Berninger, 1979). The function of the repetition is to re-solicit partner response. In session I, G1's self-repetitions are frequent and are primarily of the NMR type, and B produces a few of both types. In session III, G2 produces somewhat more NMR sequences than B and neither produces a run of more than two repetitions. In session II, G1(M) triples her previous output of self repetitions, but G2(Ba) produces none. Before role play G1 uses the NMR type. As Mother she favors the run with simple clause structure. G1(M) reacts to G2(Ba)'s discovery of a toy car with a run followed by an NMR: "Here's a little motor car, a little motor car. See that motor car? This is your motor car. (pause > 1 sec.) Your very own new motor car. Okay?" In session III, G2 and B produce a few of both types, G2 favoring the NMR, and B the run type.

The role-appropriate repertoire of actions and attitudes. Mother, in fact and in children's role enactments, engages in both domestic activities (cooking, cleaning, grocery shopping) and in activities directed toward Baby. The latter included nurturance (protecting, feeding, dressing), instruction (labeling, explaining), and entertainment (providing toys, games). Mother, at least a 'sensitive' mother, is attentive and responsive to Baby's behavior and even anticipates its needs.

G1 and G2 in their respective sessions with B find the domestic objects more attractive than other objects, even the large wooden car. Without the support of their partner, B, however, there is little opportunity to produce more than sporadic and fragmented functional role performances, e.g., feed the baby doll, iron various objects. In session II, however, a richer interpretation of Mother is possible, called forth by the presence of a partner (G2) who understands both terms of the role relationship. It should be pointed out that neither G2(Ba) nor G1(M) presents a very precise picture of Baby. G2(Ba) is beyond the crawling stage, drinks from both cup and bottle, and once uses Baby talk: "Where table?" to which G1(M) replies "Here's table."[2]

The Baby role is realized by G2 as egocentric. G2(Ba) is distractable, demanding, dependent, and sometimes unresponsive to G1(M)'s attempts to nurture, instruct, or entertain. G2(Ba) asks G1(M) to iron for her, take her to the potty, identify objects, and give food and assist-

ance. At one point G1 breaks frame by ignoring G2(Ba). G1 fails to respond to a question and inspects the toy tools; G2 immediately approaches her and claims her motherly attention saying, "Baby peed. In her pants." When that fails, G2(Ba) begins to whine, and G1 again becomes Mother. G2 clearly finds the Baby role attractive (she also tries to adopt it with B), and it is compatible with her relative linguistic immaturity and, in contrast to G1, her self-absorption. As Baby, she shows a good grasp of what Mother is expected to do. Her simple and infrequent speech in Baby role, since it contrasts with her behavior in session III, probably reflects her concept of behavior appropriate for Baby.

Finally, we can examine the concept of Mother as represented by G2(M). Unlike the older children observed in a group nursery school setting by Corsaro (1979), G1 enacts the parental role vis-à-vis her Baby as primarily nurturant, rather than authoritarian. There is no question of Mother's authority, but it is exercised gently and solely for Baby's benefit. Directives are issued to warn Baby about the stove and ironing board, to tell her what to do with toys, to keep her from spilling milk, and to try to get her dressed. (G1(M) even croons and cajoles when G2(Ba) is unwilling to hold still.) Virtually all of Baby's demands are met, but more striking is the fact that Baby's needs and interests are anticipated. G1(M) monitors direction of gaze and movements, making suggestions for play activity, and labeling objects Baby has sighted. G1(M) explains to Baby what she is doing or is about to do. G1 also reflects her concept of Mother's duty to instruct (and Baby's need for guidance) by showing or telling what to do with a hat, the lunchpail, and a bracelet. The concept of Mother, however, extends to housekeeping duties as well. G1 decides what groceries to buy and sets the table for a sister whom she expects shortly. For G1, Mother may also have obligations outside the house: she has to go to a meeting.

CONCLUSION

Analysis of the verbal form and content of relational role play, though highly productive, does not exhaust the indicators of G1's Mother concept. The overarching nurturant attitude is exhibited in selection of plans within the pretend frame, in sensitivity and responsivity to what Baby says, does, and might want as well as to her construction of Baby's cognitive and physical limitations.

A sequential listing of the pretend play activities (e.g., feed, take to grocery store, offer toy, iron) would differ little from prior observations of role play. More informative concerning the child's cognitive representation of Mother and Mothering (and the two may not be extricable at age three) is the fact that only some of the activities are actually initiated by G1. The majority are undertaken in response to Baby's changing discoveries or demands. In other words, G1's construction of her role is flexible and is realized in the interactional dynamics of

the pretend relationship.

The preceding analyses support the contention that the target child, G1, compared to the other two children, brings better developed linguistic and interactional skills to the dyadic situation with both her partners. They are skills that support her preference for enacting the Mother role and enable her to sustain it in reciprocal, relational role enactment — but only with the one partner who is suited to the Baby role. For example, we see that G1's strong tendency to ask questions which is realized with both her partners, is adapted to matters that concern her male, nonrole partner when she is with him. With her 'Baby,' she asks primarily about pretend matters appropriate to child care, i.e., feeding, toileting. Before she and G2 adopt the relational roles, however, her questions primarily concern the use of objects in the playroom, e.g., "Is that telephone yours?" In the pretend relationship the complementary role strongly influences the details of the enactment, which in turn reflects G1's concept of Mother and Mothering. Further, the proposed approach reveals consistent patterning of her behavior as it varies both with partner and with role.

The foregoing discussion leads to speculation on how and when individual children learn to engage in reciprocal role enactments. For example, we do not know whether G1 had a mother who modeled or shared in pretend mothering activities when G1 first began to exhibit representational play with objects and dolls. Nor do we know whether B could or would adopt a Father or Baby role under other circumstances.

The target child's role expertise is matched by a high level of competence in interpersonal behavior both in and out of play, according to the several and converging measures sampled. Most relevant to her unassessed but observed level of role-taking ability is the consistent attention and concern she displays to her role and nonrole partners.

FOOTNOTES

[1]An utterance was defined as a stretch of one person's speech separated by speech of the partner or by a pause exceeding one second.

[2]G1(M) and G2(Ba) both raise their mutually high-pitched voices still higher in session II than with B; other than this, few phonological or morphological features of Baby-talk were used.

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On the Origins of Theoretic Syllogistic Reasoning in Culture and the Child

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[EDITORS' NOTE: The material which follows is adapted from an article which appeared in a source that is very difficult for Americans to obtain. Because the material is exceptionally interesting, we have taken the liberty of presenting this annotated bibliographic entry in the form of a rather heavily edited version of Dr. Tulviste's original article. We retain the first person voice in order to allow the full scope of Dr. Tulviste's ideas to present themselves.]

Cross-cultural studies of verbal syllogistic reasoning have revealed considerable differences in problem-solving performance between traditional and modern (i.e., schooled and/or occupied in modern economic activities) subjects (Luria, 1976; Cole et al., 1971, 1976; Cole & Scribner, 1974; Scribner, 1975, 1979; Sharp et al., 1979). Unlike modern subjects, traditional subjects solved the problems correctly at a chance rate only, refused to make inferences from premises of an unfamiliar content, and usually explained or justified their

conclusions by what Scribner calls "empiric" statements (i.e., they related their conclusions to personal knowledge or conviction rather than to the premises).

How are these differences to be explained? Why and how could schooling influence performance on syllogistic reasoning problems? Why do schooled subjects draw inferences from any premises, and why do they usually give theoretic explanations? Does schooling merely improve syllogistic reasoning or does it change qualitatively the process of drawing inferences?

Luria (1976) has suggested that the differences can be explained in terms of the kinds of daily activities the subjects engage in, and that in the course of social and cultural change traditional subjects move from practical activities to theoretical activities and from practical to theoretical thinking. However, theoretical activities exist in traditional as well as modern cultures so perhaps a better explanation of the differences in experimental results could be found by looking for the differences between traditional and modern *theoretical* activities and by trying to find the *functions* of syllogistic reasoning in both of them. The experimental data indicate that traditional kinds of theoretical activities seem to make people relate their conclusions to what they know or believe to be true and not to demand making inferences from unfamiliar premises. If this is so, we need to explore why and how modern kinds of theoretical activities make people relate their conclusions to the task premises themselves and in what ways drawing inferences from unfamiliar premises may be functional.

"Empiric" performance has been found to be typical for all traditional groups where research with verbal syllogistic tasks has been conducted. As Scribner (1979) has noted, "certain qualitative aspects of performance are so similar that it is often difficult to distinguish the translated interview protocol of a Uzbekistanian from that of a Vai — cultural and geographical distance notwithstanding" (p. 225). Subjects with as few as two or three years of schooling, however, usually draw their inferences from premises of any content, familiar or unfamiliar, and give "theoretic" explanations (i.e., relate their conclusions to the premises rather than to their common knowledge or beliefs). Scribner stresses that theoretic explanations almost always co-exist with correct answers (empiric explanations can co-exist with both right and wrong answers).

In her classroom studies Scribner found some kinds of problems (e.g., verbal arithmetic problems) where an empiric approach will not earn a passing grade. "Fields that use technical notational systems may be considered to present 'arbitrary problems' in the sense that the problems derive from a system outside the learner's own personal experience and must be taken in their own terms" (p. 242). She also stresses that in future research we should look for the activities outside of school, especially in traditional cultures, which might give rise to the "logical genre."

The above mentioned investigators do not hold the view that schooling only improves quantitatively skills in syllogistic reasoning previously present in the subjects, but neither do they explicitly take the contrary position — that qualitative changes in syllogistic reasoning occur. Given that the schooled subjects in their experiments gave correct answers more frequently than the traditional subjects, this difference could be regarded as a purely quantitative one. However, there seem to be two findings that do not permit us to consider this explanation as sufficient. First, Luria's traditional villagers in Central Asia *did not* draw inferences from the premises of an unfamiliar content (e.g., "In the far north, where there is snow, all bears are white. Novaya Zemlya is in the far north. What color are the bears there?"), whereas schooled subjects draw inferences from any premises. Thus, this finding indicates a qualitative (i.e., all-or-none) difference. Second, another qualitative finding in this field was obtained by Scribner (1979): theoretic explanations, generally given by schooled subjects, practically *always* co-exist with correct conclusions.

A connection between these two findings should exist. We can propose that theoretic explanations indicate the existence in subjects of some specific quality of reasoning that permits them to draw correct conclusions from any premises — familiar or unfamiliar, but we must keep in mind that from familiar premises, correct conclusions can be drawn without this proposed quality also, since correct answers often co-exist with empiric explanations. It must not be forgotten either that, as Scribner points out, correct answers *and* theoretic explanations are given not only by schooled subjects, but also by traditional ones. So the proposed quality of reasoning cannot be strictly related to a certain group of subjects, although it seems to exist far more frequently in schooled than in traditional subjects. Below I shall argue that there still is a one-to-one relation between schooling (or, more exactly, modern scientific knowledge) and this quality of thinking.

In another paper (Tulviste, in press) I hypothesized that two different modes of syllogistic reasoning exist, which can be labeled "empiric" and "theoretic," in line with Scribner's classification of the explanations given by subjects to their conclusions in experiments with classical syllogisms. This hypothesis can be used to explain the differences in the experimental results of traditional vs. advanced subjects as well as younger vs. older children. In empiric syllogistic reasoning, subjects prove their conclusions by relating them (and sometimes the premises) to their knowledge of reality or to their beliefs. This kind of reasoning is used in what we sometimes call commonsense reasoning. On the other hand, in theoretic syllogistic reasoning, subjects turn their attention to the logical validity of the conclusions, proving them only against the premises. This kind of reasoning is used in scientific thinking, where it is often *impossible* to prove the intermediate or final conclusions by relating them to

reality or common knowledge, and one can prove conclusions *only* against the premises (see Leontiev, 1964, relating to Leibniz, on this peculiarity of scientific thinking). I propose that schooling, as an institution transferring scientific knowledge, demands (and possibly produces) theoretic syllogistic reasoning and the giving of theoretic justifications. Since children first acquire commonsense reasoning and only later on scientific thinking skills, this hypothesis means proposing that a qualitative shift occurs in ontogenesis from empiric to theoretic syllogistic reasoning.

It should be noted here that the differences between the experimental results of studies with younger and older children have not been sufficiently explained thus far. A new kind of syllogistic reasoning seems to appear, characterized by reflectivity, i.e., by the possibility of thinking not only about external objects and the relations between them, but also about concepts and the relations between the concepts. This hypothesis is based on Vygotsky's idea (1956) that at school the child acquires thinking in "scientific concepts," which means using reflective and systematized concepts. (It must be stressed here that Vygotsky regarded the peculiar nature of scientific knowledge as the main factor developing the child's reasoning at school.) In this paper, the experimental part of which was carried out before formulating the above hypothesis, it is applied to interpreting data on the origins of a theoretic approach to syllogistic tasks in children raised in a traditional culture.

The specific hypothesis is that the theoretic approach to syllogistic tasks (scientific thinking) first appears in the sphere of school knowledge and later can be applied to everyday knowledge. This hypothesis cannot be reliably tested on children raised in a modern environment where it is difficult, if not impossible, to differentiate clearly school knowledge from everyday knowledge, considering the influence of mass media, children's books, educated parents, etc. In Nganassan children, however, these two spheres can be more sharply differentiated. The Nganassans, the most northern people of Eurasia, are nomadic and live in the north of the Taimir peninsula. The unschooled parents prepare their children for their traditional economic activities — hunting and reindeer-breeding — and teach the children their traditional knowledge, beliefs, and folklore. Going to school at age seven, children enter a world almost unknown to them.

Investigating the origins of theoretic syllogistic reasoning in the child was not our only purpose in this study. In earlier papers I argued that in traditional cultures, where there is no contemporary science, there seems to be — according to a certain interpretation of the results of recent cross-cultural studies — no thinking in "scientific concepts" in the Vygotskian sense (Tulviste, 1975a, 1977a). I proposed that thinking in scientific concepts first appears in these cultures only as a result of the distribution of modern scientific knowledge, mostly via the introduction of formal schooling. I believe that this kind of thinking first appears in every changing culture in the sphere of school knowledge, where it is undoubtedly functionally necessary in problem solving. In the sphere of traditional thought, there seems to be no such functional necessity. Experimentation with syllogistic tasks may be considered one way of exploring the presence or absence of thinking in scientific concepts in a certain culture and its origins, because in theoretic syllogistic thought, subjects must necessarily operate within a system of concepts, basing their reasoning on connections that exist only between concepts and not referring to the connections between the related external objects. In other words, theoretic syllogistic reasoning clearly demands reflectivity, the main attribute of scientific concepts (cf. Vygotsky, 1956, on syllogistic reasoning).

I believe that it was in order to locate the particular sphere of culture where thinking in scientific concepts first appears that Luria and Vygotsky included two kinds of syllogistic tasks (with familiar and unfamiliar, or everyday and school content) into the program of their pioneer study in Central Asia.[1] But all the five advanced subjects in that study[2] drew correct conclusions from *all* pairs of premises, and the dynamics of the development of syllogistic reasoning in the course of rapid social and cultural change remained unexplored. It seems that it has not been investigated by other authors either. Experiments with syllogistic reasoning in adult Nganassans carried out by V.I. Shestakov (personal communication) showed results very much like those obtained by Luria in the remote villages in Uzbekistan.

Below I shall argue that there is only *empiric* syllogistic reasoning in traditional subjects and discuss our investigation of the origins of theoretic syllogistic reasoning not only in the child, but also in a traditional culture, where the introduction of formal schooling has brought the distribution of modern scientific knowledge and of a related mode of thinking.

The experiments were carried out in April, 1977, with 35 schoolchildren (8 to 15 years old, 2nd through 5th grade) at the Voloshanka school in Taimir. The subjects were orally presented 10 syllogisms. After each syllogism of everyday content (e.g., "Saiba and Nakupte always drink tea together. Saiba drinks tea at 3 P.M. Does Nakupte drink tea at 3 P.M. or not?"), a syllogism of school content followed (e.g., "All precious metals are rust free. Molybdenum is a precious metal. Does molybdenum rust or not?"). After each answer, the subject was asked "Why do you think so?" When no explanation followed, the syllogism was repeated, and after answering the subject was asked for an explanation again. The experiments were carried out in Russian. At school, only Russian is spoken, and as there is no Nganassan literacy, the children could not speak about school matters in their native language. In Russian, they spoke about everyday affairs as well as about school

TABLE 1.
Results of the Subjects in the Nganassan Study

Number of theoretic explanations for conclusions from school premises	Number of subjects	Mean number of theoretic explanations for conclusions from everyday premises in the same subjects
5	2	2
4	5	1
3	5	1.6
2	5	0.6
1	4	1.25
0	1	1
	22	

Number of theoretic explanations for for conclusions from everyday premises	Number of subjects	Mean number of theoretic explanations for conclusions from school premises in the same subjects
5	0	-
4	1	5
3	2	2
2	4	3.5
1	8	1.9
0	7	3
	22	

matters. There were no remarkable language difficulties. Among 35 subjects, 9 gave theoretic explanations for all conclusions, and 4 gave theoretic explanations for none. It is the results of the remaining 22 subjects that are crucial for our hypotheses. These subjects gave theoretic explanations for some conclusions, but not for all.

This "transitional" group made correct conclusions from school premises in 90 out of 110 cases, and gave theoretic explanations for these conclusions in 59 cases. (In the remaining cases, empiric or no explanations were given.) Correct conclusions from everyday premises were made in 81 cases, and 26 theoretic explanations were given. Theoretic explanations always co-existed with correct answers. As we are interested just in these cases, let us take a look at their distribution (i.e., the distribution of the cases where theoretic syllogistic reasoning was supposedly used in relation to both kinds of syllogisms).

The results presented in Table 1 indicate that subjects from the "transitional" group gave significantly more theoretic explanations for conclusions drawn from school premises than for those from everyday premises. Among 22 subjects, 2 gave more theoretic explanations for conclusions from everyday premises than for conclusions from school premises, and 3 subjects gave an equal number of theoretic explanations for conclusions from both kinds of premises. The remaining 17 subjects gave more theoretic explanations for conclusions from school premises than for those from everyday premises.

CONCLUSIONS

The experimental results of the subjects labeled "transitional" (i.e., the subjects who gave both theoretic and empiric explanations for their conclusions) confirm the proposition that theoretic syllogistic reasoning, characterized by theoretic explanation of the conclusions (but see the discussion below of this characteristic), first appears in the sphere of school knowledge and only after that is also applied in the sphere of everyday knowledge. The results presented reveal that theoretic syllogistic reasoning is not a skill previously present in the subjects, which under the impact of formal education can be applied to new kinds of problems. Rather, it is a qualitatively new skill engendered by schooling, which later on may also be applied to everyday matters.

But is it correct to label these subjects "transitional"? The data provided by the authors mentioned above confirm the view that the impact of education on syllogistic reasoning ends in a practically 100% solving and theoretic explanation of syllogistic tasks like those used in the present study. But is theoretic syllogistic reasoning really

a fully new skill first acquired at school? Can it be stated that no traditional subject ever reveals a theoretic approach to syllogistic tasks? Scribner (1979) stresses that unschooled subjects, too, give theoretic explanations, although definitely more seldom than their schooled counterparts. Some traditional subjects even justified theoretically *all* conclusions they made. At the same time, Scribner notes that "at the extreme of rural isolation (as among Luria's Muslim women) empiric approaches may be all-or-none."' How is this "extreme of rural isolation" to be understood? It seems reasonable to interpret this condition as an isolation from all factors of social and cultural change, a traditionality par excellence. So it seems correct to state that there may be no theoretic syllogistic reasoning in the cultures that are strictly traditional. But what about the less traditional people, who have had no schooling and are illiterate, but do give theoretic explanations for their conclusions? There seem to be two points that make us believe that there still may be no theoretic syllogistic reasoning without any acquaintance with modern scientific knowledge.

Firstly, scientific knowledge and thinking in scientific concepts can undoubtedly be acquired outside school. This is best illustrated by the fact that in modern societies children at the age of 5-6, not attending school, solve syllogistic tasks of an unfamiliar content and give theoretic explanations for their conclusions (Tamm, 1977). In other words, the presence of theoretic explanations could be explained through the "untraditionality" of the traditional subjects giving them.

Secondly, it seems to be the case that the seemingly theoretic explanations given by traditional subjects for their conclusions from familiar premises only too often coincide with some possible empiric explanations. It seems highly probable that these explanations are really empiric, not theoretic. For example, if we present an Nganassan the syllogism "All men hunt. Kudapte is a man. Does Kudapte hunt or not?" and he says "yes, because he wants to shoot polar foxes," we classify his explanation as empiric; when he says, "yes, because he is a man," we classify his explanation as theoretic, because he seems to justify his answer through referring to the premises. But it is obvious that the second explanation may as well indicate a reference to a cultural norm (indeed, all Nganassan men hunt). It cannot be concluded from the explanation that the subject indeed proves his conclusion against the task premises — he may be referring to the common knowledge. This last possibility is more probable if the same subject does not refer to the task premises in cases in which they are unfamiliar to him. In all cross-cultural studies of syllogistic reasoning, including our research in Taimir, tasks can be found that are given explanations which cannot be classified as empiric or theoretic with full conviction. Sharp et al. (1979) examined the content of the syllogisms on which traditional and advanced subjects did not differ markedly in the amount of theoretic explanations, and

found those to be "precisely the problems on which a correct answer is completely in tune with the experience of the subjects" (p. 55). It is highly probable that in those problems, the premises were also a commonplace for the traditional subjects, and that their explanations, remaining seemingly inside the task given, could really be empiric in nature. This difficulty can easily be overcome in future studies. The experimenter should not be content with the first best answer of the subject to the question "why do you think so?", instead, when any doubt arises in the empiric vs. theoretic nature of the answer, one should go on asking questions to find out the real nature of the explanation. This method has proved useful in experiments with children (Tulviste, in press).

Luria's data on the solving of syllogistic tasks of an unfamiliar content by traditional subjects can be interpreted as confirming the idea that they do not engage in theoretic syllogistic reasoning. Indeed, if conclusions can be drawn only from common knowledge, or if a "picture of reality" (whatever it may be) is needed to answer the questions concerning this reality and the conclusions cannot be proved against the premises, so it is understandable enough that Luria's subjects refused to draw conclusions when no such picture was available, and Cole's subjects demanded more information to create such a picture. What the subjects in these studies could not do was to make an inference from unfamiliar premises and to prove it against the premises. In the future it would be interesting to find out exactly what information would be needed to create a "picture of reality" and to convince the subjects of its "reality."

As traditional subjects seem to engage in no theoretic syllogistic reasoning at all, while highly educated subjects tend to apply it to all kinds of tasks, our 22 subjects can indeed be labeled a transitional group. They had acquired this kind of reasoning in the sphere of scientific knowledge, but they did not apply it as often in the everyday sphere.

The hypothesis made in this paper must obviously be tested in further studies with children and adults from different cultural groups before it can be said with full conviction that in both cases theoretic syllogistic reasoning really first appears in the sphere of scientific thinking. The amount of skill needed and its exact nature must be revealed.

GENERAL DISCUSSION

The hypothesis advanced in this paper includes theoretic syllogistic reasoning in a general mode of verbal thinking (thinking in scientific concepts), which in its turn is functionally related to a certain sphere of knowledge and of theoretic activity, present in some cultures, absent in others, and currently emerging in still others under the impact of social and cultural change. The ideas underlying this general approach to the problems of cross-cultural differences in thinking are

presented in earlier papers (Tulviste, 1975a, 1977a, 1977b). The general thesis consists in the following: there is no "natural" human thinking and no one direction in which it should inevitably develop in the course of its ontogenesis and cultural historical development. Rather, different kinds of theoretic activity produce different modes of verbal thinking that are necessary in creating (or generating), acquiring, and using of the respective modes of cultural texts. It is obvious that observing the behavior of people engaged in different kinds of theoretic activities will not help us make hypotheses about the respective modes of verbal thinking. Instead, we need descriptions (semiotic, linguistic, etc.) of different modes of cultural texts, to make any hypotheses for experimental studies. This is exactly what Scribner did when she focused her attention on the nature of the problems that are solved at school, looking for the reason why educated subjects give theoretic explanations in syllogistic reasoning experiments. In the present paper, it was the description of certain properties of scientific thinking, given by Leibniz and cited by Leontiev (1964), that permitted us to propose that theoretic syllogistic reasoning might be necessary to solve scientific or school problems. Analyses of different kinds of cultural texts in traditional and modern societies are needed to do the same for various other modes of verbal thinking. It seems reasonable to propose that theoretic syllogistic reasoning (and thinking in scientific concepts in general) should appear in children and in adults in a certain culture only when certain modes of texts function there that demand those modes of thinking and, respectively, produce them (at school or outside school). In the papers mentioned above, I have argued that the descriptions of traditional thought given by several authors, and first of all by Horton (1967), reveal no necessity for thinking in scientific concepts. Indeed, *when it is sufficient to prove the conclusions against the common knowledge, why should the skill to prove them against the premises appear and develop?* It seems reasonable to propose that this skill appears only when problems appear that exclude the possibility of proving the conclusions against the common knowledge.

It is in line with the above approach to think that if the texts of different cultures are markedly different, verbal thinking must be different, too. The exciting idea expressed by Levy-Bruhl many years ago that thinking is qualitatively different in different cultures, has found no clear experimental support nor denial in the recent cross-cultural studies. If a real qualitative difference has been obtained in the present study, it consists in the fact that a certain operation of thought has become *reflective* or conscious in the course of the cultural-historical development of thought. This is in line with one of Vygotsky's main ideas concerning the development of verbal thinking in the child and in culture. It is possible that no qualitative differences have been revealed in the cross-

cultural studies so far because they have been commonly thought of as situated in the logical, not in the psychological properties of thinking. Cole and Scribner (1974, p. 163) demonstrate convincingly that even when the traditional subjects substituted new premises for those presented by the experimenter, their reasoning in attempts to solve the task can easily be presented in a syllogistic form. There is no evidence that the operations carried out by traditional subjects were more *simple* than those carried out by educated subjects (in a logical sense). The empiric explanations given by traditional subjects are certainly not simpler than the theoretic ones offered by their schooled counterparts. Why should they be, indeed? But even if there is no logical difference at all, this does not mean that there is no psychological difference. Maybe we shall be able to explain the real differences in the experimental results if we turn to the possible and predictable psychological differences rather than to the logical properties of the thinking in different groups of subjects.

It does not follow from the ideas expressed here that *all* thinking should be different in modern and traditional cultures, nor that cultural change would change *all* the verbal thinking of human beings. There are universal kinds of theoretic activities and universal modes of cultural texts, and the respective modes of verbal thinking should be uniform across different cultures. In terms of syllogistic reasoning, this means the following: in modern cultures, relating the conclusions to the premises is certainly not the only way of proving them. Scientific thinking must not and cannot substitute for common sense. In the experimental situation, the educated subjects do tend to apply theoretic syllogistic reasoning to all kinds of syllogistic tasks. But it would be sufficient to change the instruction, and the subjects would relate the premises and the conclusions to their common knowledge and personal convictions. Moreover, this occurs often enough even in the usual experimental situation, when the subjects are told to draw and justify conclusions from the given premises, or even when they are explicitly told to judge the logical validity of the given conclusions. Indeed, several authors have noted and specially investigated the impact of the subjects' personal convictions on their performance in the experiments with syllogistic tasks. Morgan and Morton (1944) came to the following conclusion: "Our evidence will indicate that the only circumstance under which we can be relatively sure that the inferences of a person will be logical is when they lead to a conclusion which he has already accepted" (p. 39, cited in Henle, 1962, p. 367). In a somewhat less categorical form, the idea of the impact of the subject's convictions on the inference is stated by Janis and Frick (1943) and by Henle (1962). All of them worked with educated subjects. So it is not that educated subjects have only theoretic syllogistic reasoning at their disposal, and are therefore totally different from the traditional subjects who seem to reason empir-

ically. Rather, a new mode of reasoning appears in the educated subjects, that functions *parallel* to the empiric syllogistic reasoning and serves to solve problems that cannot be dealt with by the means of the latter. In other words, a new mode of thinking does not substitute for those previously present, obviously because those remain functionally necessary in various kinds of activity. This process is responsible for what can be labeled the historical heterogeneity of multiplicity of thinking (considered at some length in Tulviste, 1975b). Sharp et al. (1979) tend to reject the idea suggested by some of the results of the recent cross-cultural studies in thinking that schooling might cause a qualitative change in thinking processes, because schooling does not seem to change *all* thinking. Indeed, why should it? But the possible qualitative changes must not consist in a total shift in all thinking. Rather, they consist in the appearance of qualitatively new modes of thinking, which function parallel to those that were present previously.

The Vygotskian term "thinking in scientific concepts" has been used in this paper, and some related ideas of Vygotsky have been applied. The very term shows that the respective mode of thinking has been defined through its *units*. Those were described by Vygotsky in detail, as different from various kinds of "complexes." But it is reasonable to propose that a functional relatedness between a certain kind of the units of thinking and certain kinds of thinking operations should exist. This aspect was not elaborated by Vygotsky, and there is no experimental evidence so far. Still, it is not clear why higher order units of thinking should appear at all, if all operations are reliable in lower order units as well. Theoretic syllogistic reasoning seems to be an operation that demands "scientific concepts," and that cannot be realized in various "complexes." Indeed, it demands relying on connections that exist only between concepts, and not between the respective external objects. Scientific concepts are defined through other concepts, and often cannot be defined or explained otherwise, while various kinds of complexes are "defined" through the respective external objects (as investigated in the Vygotsky-Sakharov classification studies), or through perceptual and/or emotional experiences of the subject, and possibly need not be defined through other "complexes." The "complexes" therefore seem to be inadequate for a thinking operation where any turning towards reality and emotions has a disturbing effect, and connections between concepts must prevail. Of course, theoretic syllogistic reasoning is but one operation among others that demands "scientific concepts" be realized.

Last but not least, if theoretic syllogistic reasoning has its origins, strictly speaking, not in the child itself, and not in the traditional cultures where we are investigating its distribution under the impact of social and cultural change, where are its real origins, then? It seems that we should look for those in the social and cultural situation of Ancient Greece, where scientific thinking (differing from traditional systems of thoughts) first arose. From there, it has come into different cultures and changed the thinking of human beings. But this is another problem.

FOOTNOTES

[1] In Shif's (1935) study, directed by Vygotsky, three different methods (but no syllogisms) were used to find out in which sphere — that of school concepts or that of everyday concepts — *arbitrariy,* as another distinguishing feature of thinking in "scientific concepts," according to Vygotsky, first appears in the development of the child's thinking at school. It was suggested that arbitrarity first appears in the sphere of school knowledge, where the shift from "complexes" to "scientific concepts" first occurs, and that schooling as scientific knowledge teaching leads the development of conceptual thought in the child in general. Vygotsky (1956, p. 190) proposed that in traditional cultures thinking occurs in "complexes," not in "scientific concepts." It was natural to use this general scheme of investigation in the Uzbekistan study, undertaken to find out the impact of social and cultural change (including the introduction of literacy training and elementary schooling) on the development of cognitive processes of adults from a traditional background.

[2] Not 15 as on p. 116 in Luria, 1976. Cf. p. 103, ibid. But this is not important. Luria notes (p. 103) that the data obtained from the group of advanced subjects "were so uniform that enlarging it any further seemed pointless."

[3] Cf. also Sharp et al. (1979): "The Mayan adults from Ticul respond significantly better than a comparable population from the smaller, more traditional town of Ramonal" (p. 54).

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De Lone, Richard H. *Small Futures: Children, Inequality, and the Limits of Liberal Reform.* A Report for the Carnegie Council on Children. New York: Harcourt Brace Jovanovich, 1979.

Small Futures challenges the traditional American view that a child's future in our society is determined by ability, early childhood training, or education. Class, race, and sex emerge as the most significant determinants of a child's future in de Lone's study of existing evidence.

According to de Lone, reform movements fail because they emphasize equal opportunity for children in the future rather than equality itself. Although he believes that the concepts that underlie our reform programs also undermine them (he sees most of these programs as attempts to do patch-up work on families that are crippled by their social position) he does not advocate eliminating them, "half a loaf is better than none...."

For too long, de Lone believes, we have been putting the responsibility of reducing future social, economic, and racial inequality on the children of today. He argues that if we want children to have equal opportunity, we must work directly to create greater equality in the social conditions in which children develop.

The following information supports de Lone's position that inequalities in the distribution of power, influence, income, wealth, and employment opportunities are still with us: (1) The top fifth of U.S. families receive somewhat over 40% of the country's net family income, while families in the bottom fifth receive only 5 to 6%. (2) The top 4% of the families own 37% of the personal wealth; the net worth of the average family in the bottom 20% is zero. (3) Even when measures of individual ability are identical, children whose families are in the top tenth of the income distribution are 27 times as likely as those from the bottom tenth to achieve upper income status as adults. (4) Only one male in five exceeds his father's social status through individual effort and achievement. (5) The employment, earnings, and social mobility gaps which separate Blacks and Whites have scarcely changed in this country in a century.

It is inequalities such as these which make it impossible for children born poor and those born rich to enjoy truly equal opportunity.

Small Futures traces the sources of inequality to a basic tension between the democratic and capitalist strands of our heritage. It argues that efforts to resolve that tension have had limited success because: (1) In the name of "equalizing opportunity," social reform has focused on improving individuals — particularly children — without adequately addressing the social and economic structures and forces which influence individual opportunity. (2) Americans have generally failed to perceive that the ultimate penalty of poverty is the pervasive influence on one's adult future of "growing up unequal," not merely the hardships produced by a lack of material goods. (3) Social reformers have relied on institutions — including the schools — which may do as much to perpetuate inequality as to diminish it. (4) Flawed social policy has been buttressed by flawed psychological theories which overemphasize the importance of genes and early childhood experience, and underemphasize the way basic social structures such as the distribution of income influence patterns of development.

De Lone does not simply criticize; he makes specific suggestions on ways we can begin to reduce the economic distance between classes by initiating such public policies as: full employment, targeted economic and investment development, strongly supported affirmative action, and income distribution through a mechanism such as credit income tax. For de Lone, the most necessary and important single change is a change in thinking; we must understand that we cannot put the burden of achieving equal opportunity on our children, but rather must attempt to restructure our society in ways that will promote greater equality for everyone.

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