The Development of Event Memory

John Morton

MRC Cognitive Development Unit, London

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My debt to Julie Wilkinson in this paper should be apparent. She designed and carried out the experiments reported herein and has discussed at great length the issues raised. I have added some statistical and theoretical analyses of my own.

Requests for reprints should be addressed to:
Professor J. Morton, MRC Cognitive Development Unit, 17 Gordon Street, London WC1H 0AH

The Psychologist: Bulletin of the British Psychological Society (1990), 1, 3-10.

"What happened at school today?"
"Nothing."

With small children, this lack of response is not perversity, but represents a real difficulty the child has. What is this difficulty due to? Is it that the information does not get in or does it get in but fail to be discriminated? In either case we could link it to another phenomenon of early childhood - infantile amnesia - described by Freud (1973), among others. The phenomenon is that past the age of ten, or thereabouts, most of us find it impossible to recall anything that happened before the age of four or five. Freud attributed this memory failure to repression. Further than this, he is quite clear when he says:

> We have... good reason to believe that there is no period at which the capacity for receiving and reproducing impressions is greater than precisely during the years of childhood. (Freud, 1977:90)

I agree with this wholeheartedly, but have great difficulty in accepting Freud's explanation of infantile amnesia. I do not believe that, as a result of guilt induced by infantile sexuality, we repress the whole of the first four or five years of life. I would want to look for a more cognitive explanation, an account which did not imply that young children had the cognitive apparatus of adults.

More recent accounts of infantile amnesia have proposed different answers to the question. Neisser (1967) suggested that the problem was a mismatch between the data laid down at the time of the events and the schemata used at the time of recall. For Neisser the recall of events was seen as largely reconstructive and the schemata used for the reconstruction would expect to find the data in a particular format. Some years later Neisser (1988) had modified his views and stressed the role of social factors in the development of autobiographical memory skills.

Katherine Nelson and her collaborators also believe that the data has not been registered. They have carried out a large number of studies in which they ask the child questions of one of the following two forms:

> *Generic* - "What happens when you have dinner?"
> *Specific* - "What happened when you had dinner yesterday?"

They found that three-year-old children could give good accounts of what happens, in response to the generic question - (e.g. "I wash my hands and sit at the table"), and that these accounts were correctly sequenced and remained consistent over time (Nelson & Gruendel, 1981). With the specific questions, much less material was produced; some children could not answer the question at all and very often the replies include general as well as specific information, using the general, tenseless form of the verb - e.g. "I finish with ice cream".

Nelson and her colleagues concluded, as a result of these experiments, that children have no memory for individual episodes, only for what they call General Event Representations (GER) - "a kind of generalised knowledge". A GER is a schema, which the child gradually builds up as a result of the repetition of events. If events repeat, then fusion of the experience takes place and specific memories are no longer available. The only events which would be remembered, then, would be events which deviated significantly from routine (Hudson, 1986).

We might, then, define **childhood amnesia,** in contrast with infantile amnesia. The latter concerns the inability to recall one's life history at the age of four from the vantage

Table 1: Number of acts recalled from two mealtimes, in and out of context (from Nelson & Greundel, 1986)

	Lunch	Dinner
School	4.65	4.00
Home	4.70	3.90

point of a ten-year-old or later. By childhood amnesia I refer to the four-year-old child's seeming inability to recall things the following day. Why should so little be recalled? What characterises the events or fragments which are recalled? In the GER framework these events would be characterised by terms such as *salience* or *novelty*. Can we define such terms independently of the phenomena which provoke them?

There are a number of criticisms of Nelson's formulation. The most serious is their reliance on non-directive questions as a cue for recall. Other people have found that even two-year-old children are responsive to more detailed questioning (e.g. Fivush *et al*, 1987). A second problem is that the questions were asked out of context. Of course, in the GER theory, it should not make any difference where the questions were asked. In fact, Nelson and Gruendel (1986) have shown that there are no effects of context for three-or four-year-olds for the questions:

> What happens when you have lunch at school?
> What happens when you have dinner at home?

The questions were asked both at home and at school. The data are given in Table 1. It is clear from these data that the retrieval of scripts is not dependent on cues from the environment.

Nelson herself says:

> Instantiating a GER in a given situation serves the child as a "cognitive context" and it is this context, not the external, objective context, that does or does not serve to support performance in a given situation. (Nelson, 1986:242-243)

This is a bold and very cognitive claim which I am loath to dispute, since most of my time is spent repelling attacks from the other direction. However, I feel that what is true for script-eliciting questions might not be the case for episode-eliciting questions where both internal and external context might play a role.

A third caution with the work on General Event Representations is that it relies entirely on verbal report. This is likely to lead to underestimates of what could be recalled, particularly with younger children, and even more massive underestimation of what is stored.

Table 2: Park study - mean number of items recalled under different cuing conditions. Figures are cumulative /21 (from Wilkinson, 1988b)

	Out of context	In context
Initial "yesterday" question	1.4.	1.3
Spontaneous recall		6.3
General questions	3.4	11.2
Probe questions	9.5	15.9

The Park Study

These three factors, the nature of the questions, the role of context and the use of verbal report, were looked at by my student, Julie Wilkinson. Julie ran an experiment with four-year-old children (Wilkinson, 1988a,b). This involved taking pairs of children out for a walk. They went to a park, playing games both on the way and when they got there. On the way back they called in at a shop and bought something to drink.

Nothing unusual happened. Julie was familiar to the children and the children often went for walks in the park with a variety of people. The event, then, was a good candidate for a GER.

The following day the children were questioned about the event either in a room at the school or on another walk which passed along the same route. So in the case of the second group of children the context was reinstated and, in addition, there would be the opportunity for the children to use non-verbal means of recall.

In all cases, the first question that was asked was like the specific question asked by Nelson. Very little information was produced by the children in reply to this question. This can be seen in Table 2. When the child could produce no more, the in-context group started off on their walk. The children were asked to recall anything they remembered while they were on the walk. When Julie and the child passed a place where something had happened the child would often spontaneously tell what had happened there. If this did not happen Julie would cue them by asking "What happened here?" If there was still no recall, she asked a more direct question such as "Did we find something here?" With the children who were questioned in the classroom, a series of probe questions were asked which were designed to give successively greater cues. In all cases Julie provided the correct answer if the child failed.

The data were quite outstanding. To start with, the probe question produced an enormous amount of extra material. Secondly, the effect of context was massive - as you might have expected - but not as the GER model would have predicted.

Of course, it could be argued that the children on the walk had the advantage of being able to act out what happened. This was one of our criticisms of Nelson's data - they assumed that if it could not be spoken it could not be in memory. (The English legal system makes a similar assumption. I hereby coin the term *linguacratic theorising*.) What Julie did was to separate out those items which could be recalled non-verbally from those which had to be recalled verbally - such as the name of the song they sang. The data are given in Table 3. She found that while there was a big advantage

Table 3: Park Study - effects of context on verbal and non-verbal recall (from Wilkinson 1988b)

	Out of context	In context
Free recall		
verbal/11	1.0	3.3
nonverbal/10	0.4	3.0
Total recall		
verbal/11	6.0	8.9
nonverbal/10	3.5	7.0

for the items that could be acted, there was still an advantage of context for the items which had to be verbally recalled.

In summary, then, this experiment showed that while free recall for a routine event was very poor, recall improves dramatically if you use directive questions, and there is a massive effect of context, especially when non-verbal methods of recall are allowed.

The search for a theory

From the data in the Park Study, it is clear that we need a theory with the following characteristics:

1. It allows the nature of the questions to affect recall;
2. it allows situational context to affect recall;
3. it allows non-verbal recall.

A theory which will satisfy these requirements is a model for memory which I put forward a few years ago with Richard Hammersley and Debra Bekerian (Morton, Hammersley & Bekerian, 1985). This theory arose in part from consideration of three particular memory phenomena which seem to be shared by most of us.

1. **What was his name?** We all have the experience of being aware of everything we know about an individual, other than their name. This happened to me quite dramatically a few years ago when I was working in Cambridge and was a prime stimulus for the model. Someone's research was being discussed. The main results were familiar to us both. We knew where the man worked, where he lived, what his wife was called and the last time he had given a talk in Cambridge. We felt certain we would instantly recognise his name if it is produced by someone. And we were certain that if we had started with his name we would have been able to retreive the rest of the information.

2. **Don't you remember?** The second memory problem that seems to be shared by everyone is that of not being able to recall an event in spite of most detailed cues. On our tapes, for example, we have one example of a husband who could not recall an evening where he nearly had a fight with a drunken waiter about a table reservation until his wife reminded him that the restaurant had a long driveway with orange trees. The content of the episode itself did not serve as a cue; something else did.

3. **What made me think about that?** The third class of memory experience which appears to be ubiquitous is the experience of a memory being triggered spontaneously by something which was just a part of the background for an event and irrelevant to the content of the memory. Common triggers of such experiences are specific locales in town or country, scents and certain pieces of music. Here is an example taken verbatim from an informant:

> A couple of years ago I changed my perfume. The perfume I wore before that I had worn during a very unhappy time in my life. A few months ago, I found this large bottle of perfume and thought, "I can't let this go to waste," and sprayed some on. Almost immediately I was back in hospital coming around after having my stomach pumped.

Note that the smell was not the smell of the hospital. It was not content addressing.

What we learn from these three kinds of event is that we need a model which readily allows the following three properties:

1. Not all knowledge is retrievable;
2. the central parts of an episode do not necessarily cue recall of that episode;
3. peripheral cues, which may be non-essential parts of the context, can serve to cue recall and may be the only effective cue.

The Headed Records model was designed to satisfy these requirements.

The basis of the Headed Records model is that our memory is divided up into discrete Records. Either all of a Record is accessed or none of it. Each Record is linked to a Heading. The Headed Record, or HR, is the basic structural unit in memory. We regard HRs as being structurally unrelated to one another. In memory search it is the Headings that are examined and not the Records. There will be a number of components in the Headings, any of which can be used for access. Headings cannot be retreived though. Only the Record can be retrieved. Let us see what happens with the three kinds of memory problem. In the case of the forgotten name, we assume that the name is in the Heading but not in a Record. If we access the Record by matching other parts of the Heading then the name cannot be found.

Our second example said that central parts of the episode are not always effective as cues. In other words, if the information is not in the Heading it will not serve as a cue. With Headed Records this does not present a problem. The informational importance of an item is unrelated to its function as a cue.

Finally, we have the perfume. And it should be clear by now that aspects of the context or aspects of the preceding episode could be in the Heading and could cue you unexpectedly. In none of these cases do we find unrestricted content addressing.

Content

I believe that cultural uses of memory, to make joint plans and share experience, are secondary to the need to interpret the perceptual world and to guide our actions. We do both of these things on the basis of our experience, and I believe that our memory system is formed to allow this to happen efficiently. The content of Records depends on the nature of the current processing. There are two broad classes of Record, which can be classified as primary and secondary. Primary Records are those which result from the normal activity of interpretation of the perceptual world. Their contents are the products of cognitive processes and will include action specification. The associated Headings will include goals and context.

Secondary Records are those which result from the retrieval of primary Records in the course of reminiscence or the retrieval of a primary Record which is being used as the basis of a narrative. In the case of the narrative, the form of code will have been changed into a verbal one.

As I said before, Headings have a number of components. Roughly speaking, anything that contributes to the retrieval of a Record will be in the Heading. An experimental way of determining the components of Headings is through a comparison of the relative effectiveness of variables in a recognition memory task compared with a recall task. The reason for this lies in the difference between the way these two tasks map onto the HR framework. With recognition memory you ask the subjects whether or not they have previously seen or heard the particular stimulus. If this material is in a Heading then nothing else will be needed to retrieve the Record. Context would in any case be superfluous. In a free recall task, the subject is given only some notion of the topic and the circumstances of previous encounter. The material itself has to be found in a Record and context could, in principle, help recall.

It turns out that context affects recall but does not affect recognition memory. So, as an experiment by Goddon and Baddeley (1975) showed, if you are a diver and learn something underwater you can recognise that material equally well on land. However, recall is worse on land compared with underwater. We conclude that the material itself is in the Heading and is usable as a cue in the recognition memory task without need for support from the context. With

the recall task, it is the context that carries the burden of retrieval.

Description

How do we set about searching? Suppose you are asked, "Could you tell me the address of your best friend, please?", you will have to reformulate before searching. For example, you will first have to look for the name (or other identifier) for <best friend> before looking for the address. Following Norman and Bobrow (1979), we use the term *Description* to refer to the information used to search with. Retrieval, then, depends upon getting a match between the Description and the Heading.

An anology would be trying to find a book in a library. You have to get the right kind of information and get it in the right order if you are going to find the book you want. For such reasons you have to be able to form the kinds of Descriptions that will match your own Headings. In fact, the only reasonable state of affairs would be that the creation of Headings and Descriptions is the responsibility of one and the same mechanism.

Of course, there are a number of other things that are necessary to do. When you have retrieved a Record, you have to check that it contains the information you want, and, if it does not, a new Description has to be formulated on the basis of the information available. Some of this will be automatic, but, when the automatic systems fail, then the reformulation of the search strategy could become conscious.

Let us think briefly about the way such a system might develop. As we get more experience we are going to use different things as cues. In particular, when we develop language we will get a whole new set of language-based elements for the Headings. Consider, then, what would be happening to you as a three-year-old. Your conceptual system is just beginning to set up useful cognitive categories, and your language system is still rudimentary. You have a particular set of Descriptions that seem to work. You create new Headed Records of your current experience. Then, suppose that right now, as an adult, you try to access one of the Records you laid down as a three-year-old. You form a Description, but it is a Description based on your *current* way of conceptualising the world. This will fail if you are trying to search for something set up using the organising system you used at the age of three.

This failure of retrieval is very severe. Possibly the only categories that have survived over the years are our basic emotions. Only under very special circumstances will we be able to retrieve the original Records. The exceptions will include episodes that we have repeated to ourselves over the years or heard other people repeating at a time when our Heading-Description system was close enough to the adult form to be compatible. These would be secondary records. Apart from these episodes we will, to all intents and purposes, be amnesic for our infant and early childhood experiences. We do not need repression as an explanatory concept for infantile amnesia.

The Retrieval Cycle

Next I want to look at changes which occur in the processes which operate within the Headed Records system. Before I do this I must introduce you to the Retrieval Cycle. This is a concept that has been explored by Williams and Hollan (1981).

Remember that the primary function of our memory system is to enable us to interpret the perceptual world and to plan our actions. To do this we retrieve one or more Records that are relevant to the current input. Suppose you are in the middle of a romantic conversation in a restaurant. You are using your prior experience - that is, the appropriate Record has been retrieved. The waiter then arrives at your table. You would not be advised to interact with the waiter using the same script! What has to happen is that the appropriateness of the current processing must be monitored continuously. It must do this by reference to the current goals. We call these goals the Task Specification.

The same thing operates when you are asked a question. If I ask "What is Bill Smith's address?", you will use "Bill Smith" as the Description. But you have to examine the Record you retrieve to check that it contains the information you want. If it does not, you have to formulate a new Description and go round the retrieval cycle again.

One can readily see the operation of this cycle. Ask someone a simple question like "What did you do yesterday afternoon?" Our experiments showed that it was rarely that someone could answer a question like that directly. Here is an example:

> e. What happened yesterday afternoon?
> s. ... 5secs ... What happened yesterday afternoon?, er, what happened yesterday afternoon? Right, er, thinking about what was yesterday. Oh my God, what's today? Wednesday today so it must have been Tuesday. What's so special about Tuesdays? Tuesdays are general seminar day, made the tea, er, ... (meta comments) ... What did I do after lunch? Ah, I've got it. I didn't come in yesterday morning, so I came in for lunch, yes I came in for a late lunch and then I was running around. Did I run any subjects yesterday afternoon? ... Er, Good God, I can't remember. I can't think what I did between coming back from lunch and four o'clock. OK, yes, right, after lunch, yes, it relates to teatime. I went to Safeways and got the biscuits, then I came back, and then, I think, I sat here, actually, and worked out ... no, yes, I did a bit of work, it's all coming back now! And then Tim asked me to do his experiment so I did Tim's experiment and by that time it was teatime.

Simple questions are not easy to answer even by an adult who succeeds only by going round the retrieval cycle a number of times, evaluating the information he had, and formulating a new Description every time.

The Witch Study

With this background in mind, I am going to describe another experiment carried out by Julie Wilkinson (1988b). This was carried out with a group of children aged 41 to 57 months. These children attend a Day Nursery and the event took place in mid-afternoon, at teatime. Normally what happens is that the children have something to eat and drink, sitting at a table with their own placemat, identified by a picture - e.g. a train, ball etc. After they have finished, the children are sent to the bathroom to go to the toilet and wash their hands and face. They would then sit in a particular place and read until the tables are cleared and toys put out.

On the day in question, the children found that a black cat had been stuck to their placemats. After tea a "witch" came into the classroom dressed in black, with a pointed hat. The witch said that her name was Wanda and that she was sad because she had lost her black cats. This caused great excitement in the room. The witch walked round the room and found the cats on the mats and told the children that these were hers. The children were told that they should give the mats to the witch when they went to the bathroom, say some magic words, and the cats would tell her whether the children had been good today. After all this, the children went to the toilet as usual, and then went to the staff room to see what Julie had - this was an owl belonging to the witch, and the children were encouraged to stroke and talk to it. The whole event took about 20 minutes.

We can see the event as being made up of roughly three episodes:

1. Table, cat on mat, witch;
2. bathroom, give mats to witch, magic words, wash;
3. staff room, Julie, owl.

The first two of these are superimposed on normal routines.

The children's recall was tested the following day. The first question was "What happened yesterday teatime?" This was the standard, non-directive question commonly used by other experimenters. Since the event was not standard, however, one would have expected that recall would have been good.

If the children did not answer, they were asked:

"Something special happened at teatime, what was it?"

and then:

"Tell me about the witch coming at tea-time?"

At the end of the free recall the children were asked directive questions such as:

"What was the witch looking for?"
"What did you have to do at the bathroom?"

Correct responses - There were eleven children altogether. The maximum number of items they could recall was 14. In response to the non-directive question, the mean number of items recalled was only 2. In fact, only four of the eleven children made any response to the first question and they averaged 5.5 items each (which shows how misleading averages can be!). Two other children responded to the prompt that something special had happened but the rest needed reminding about the witch before they could remember anything. These children recalled an average of about 4 items. With the directive questions there were another 4 items recalled giving a total of 7.8 items on average. This compares with a mean of 2 if we had just taken the answers to the first question. As with the Park Study, we find non-informative, directive questions succeed in eliciting quantities of information.

The effects of age - There was quite a large age range in this group of subjects - from 3:5 to 4:9 - and it would be surprising if they were a homogenous group. The five children who needed the specific reminder of "the witch" had an average age of 3:10. The six children who were able to retrieve "witch" for themselves had an average age of 4:4. On a Mann-Whitney test these groups gave a $U = 3$, $p = 0.015$. The total number of items recalled, which ranges from 4 - 11 items out of a possible 14, correlates with the children's age with $r = 0.74$ ($n = 11$, $p<0.01$, two-tailed). The free recall scores gave $r = 0.58$. This misses significance.

These figures suggest that even within the age range of our subjects there are changes in ability to access memories and in the ability to elaborate them.

The organisation of the material - The question that proved to be the most revealing with respect to the way the information was organised was:

"What happened at the bathroom?"

In response to this question, one child said nothing, and four children responded entirely with generalities:

e.g. "wash our face and go toilet"

Three children gave generalities plus information from the episode that followed:

e.g. "wash ourselves and then we had to come in here to see the owl"

and a further three just gave information from the following episode. No child responded with information about yesterday's specific events at the bathroom.

These responses indicate that "bathroom" as a memory probe, what we call a Description, has two effects. First, it matches the Heading for a Record which contains a general schema for what you do in the bathroom. Second, in the context of the narrative that the child and Julie were exploring, it is part of the Heading for the Record of the episode which *followed* the bathroom - that is, going to the staff room and seeing Julie with the owl.

What had happened with the material concerning the witch at the bathroom? Well, in the course of the free recall part of the interview, seven of the children had mentioned giving the mats to the witch. One child (s.9), during the free recall, said:

"The witch was at the bathroom"
and "the witch got the mats".

However, in response to "what did you have to do at the bathroom?" this child said "I went you to hear the owl *(sic)*" and did not mention the witch. So the information was in there somewhere. If BATHROOM is a cue for the following episode, then the more specific question ought not to help. Indeed, of the six children who mentioned the owl episode in response to the bathroom question, none gave event-appropriate replies in response to the more specific question:

"What happened at the bathroom with the witch?"

I conclude that for these children the bathroom episode was part of a record which could be accessed through *the witch in the classroom* but not through *the bathroom*. On the other hand, if BATHROOM as a cue gives rise to a schema record, then there is a chance that a more specific cue would get to the required episode. When the children were asked the more specific question, two of the four who had responded with generalities alone gave event-appropriate replies:

e.g. "gave her our mats"

Of course, these numbers are breathtakingly small, but sensible patterns seem to be emerging. If the material were represented in a network, it would be difficult to understand why BATHROOM as a cue would not lead to the retrieval of material concerned with what happened there. The retrieval of events that occurred elsewhere would be mysterious. We would not expect BATHROOM to have a preferred associative link with OWL!

The dynamics of recall in a four-year-old

Let me now discuss some other features of recall. Here is a typical dialogue between child and experimenter.

E. Can you tell me what happened at teatime yesterday?
S. (aged 49 m) yes.
E. Can you tell me all about it?
S. A witch came.
E. Anything else? What else happened?
S. We had cats on our mats.
E. Anything else? What else happened?
S. We saw the owl.
E. What else?
S. And you was holding the owl.
E. Yes I was. Anything else you remember? ... What else?
S. The witch said give me our cats back when you go to the bathroom.
E. Anything else?
S. (shakes head)

The main thing to notice is that the experimenter kept on encouraging the child by asking "anything else?" or some-

thing like that. The child responded to this but never produced more than two points at any one time and only from one episode.

He starts off with the witch, then the cats on the mats, then Julie and the owl, finally giving the cats back at the bathroom. This has been diagrammed in the first line of Figure 1. In this diagram, the box corresponds to a single utterance. Note that the episodes are in the correct order except for the final one. The reversal is indicated with the double arrow.

This child contrasts with the following one.

E. Can you remember what happened at teatime yesterday? Can you tell me all about it?
S. Yes.
E. What happened?
S. When we were having teatime a witch came and we had her cats and we gave our mats to her.
E. Anything else?
S. Yes. She went and she gave some kisses.
E. Anything else that you can remember?
S. No.

This child manages to produce all she knows in a single utterance. She introduces the witch, then the cats from the first episode and then giving the mats to the witch from the second episode. This is diagrammed in the second line of Figure 1. Only one other subject produced a narrative like that.

E. Can you remember what happened at teatime yesterday?
S. Don't know.
E. Can you remember something special happened yesterday at teatime? Remember the witch came? Can you remember it now? Can you tell me what you can remember? What happened?
S. She said, "Where's my cats?" and then she said, "before you go to the bathroom give me your mats" and then, "take the cats off your mats and bring them back" and she said, "when you get washed go and see what Julie's got for you."
E. Anything else? What happened then?
S. We got washed and tidied up and went to see what you got. A owl.
E. Anything else you can remember?
S. (shakes head)

It is remarkable how one has to persevere in order to get some children of this age to speak. The representation of this child is given in the bottom line of figure 1. Inspection of this figure reveals that only in one case are there more than two items recalled from any one episode - and that is the repetition of "witch" in the first subject.

This is the only exception in the 24 utterances produced by the 11 subjects in the free recall phase.

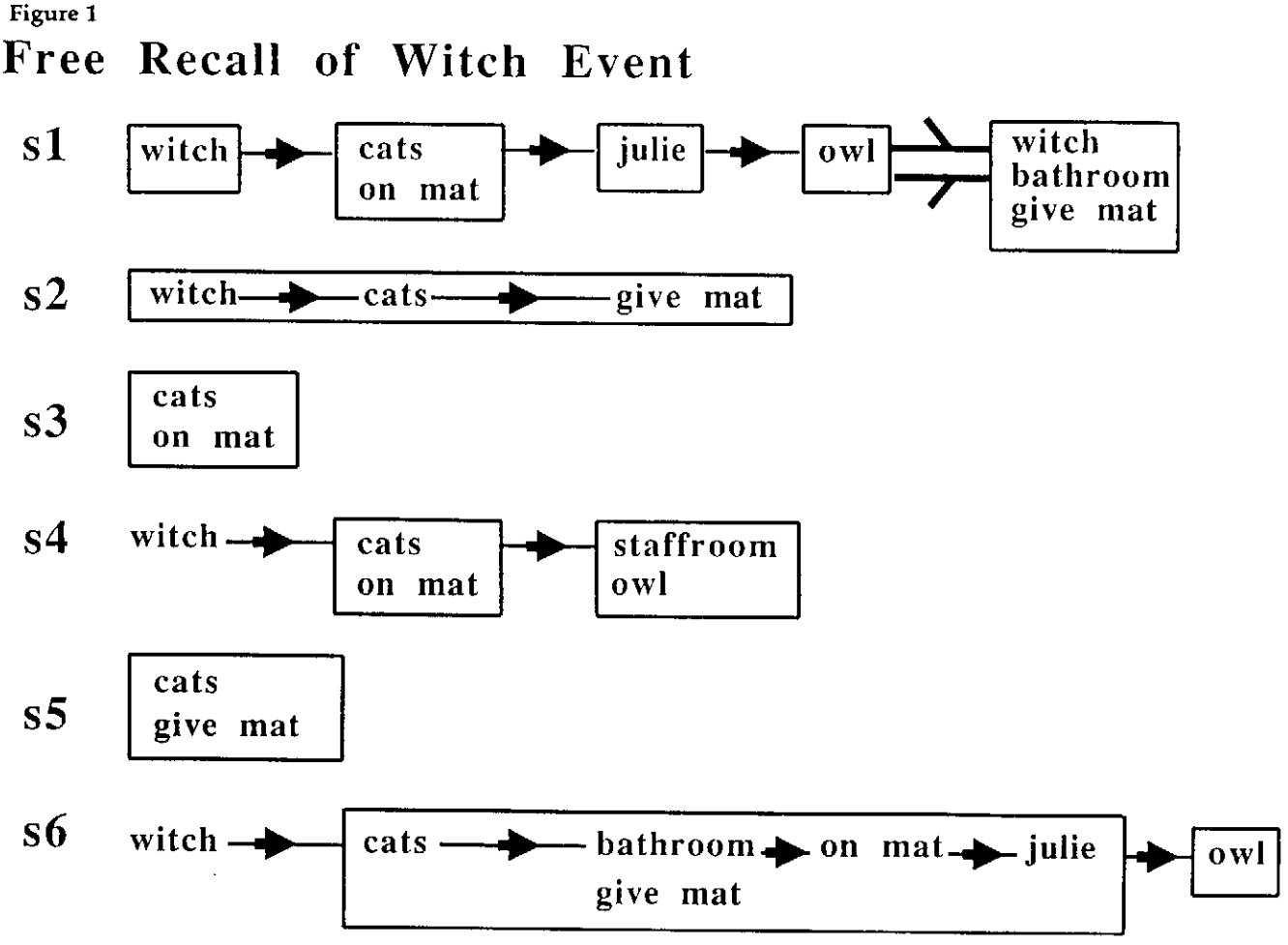
The second thing we can notice is that with only two exceptions children only output information from one episode at a time and then stop. They do not require any specific cues in order to continue; they just need encouragement.

How might this be interpreted? In the Headed Records model we would interpret these findings in terms of process limitations. We would suppose that the three episodes were coded into three separate primary Records. When the child retrieves a Record two things happen:

1. There are restrictions on the amount of material output. This would be simply a problem of mapping the contents of the Record onto language.

2. Once the output from one Record has finished, the child does not automatically proceed to form another Description from the material available. Perhaps the Task Description is such that the current goal is thought to be ful-

Figure 1



filled. This goal might be "Satisfy Julie", and the system tries to get away with as little as possible. When Julie says "Anything else?" a new goal is set up with the result that a new Description is formed from the available material.

The next thing to notice is that in only one case does information come in the wrong order. Note that this is not simply a property of the overall event. Julie is doing the questioning, and so it would not have been surprising if the children had started off by recalling Julie and the owl. The conclusion is that each episode provides part of the Heading for the Record of the following episode. I pointed out earlier that a majority of children, when given "bathroom" as a cue, recall information from the "owl and Julie" episode. These two pieces of data, then, point in the same direction.

The effect of narrative on recall

We have seen that the narratives produced by the children in this experiment have lacked structure. In an attempt to increase the structure we followed up on the experiment I have just described by telling the children a story about the event they had witnessed. This took place a week after the event itself. The children were taken one at a time and were read a narrative in the form of a story about a child of the same name. As one might expect, the children were engaged by this device. Only seven of the original eleven children were available. These were compared with a group of six children from the same nursery who were told the story twice, at an interval of a week. All children were questioned the day after they had heard the story. This followed exactly the pattern that had been used for the event.

The results were very striking. If one just takes the twelve items which were scored, the children who had experienced the event had an increase of only one item in free recall and virtually no gain in the cued recall. The children who heard the story twice did appallingly and had about the same improvement on the repetition as the first group. Only two children in the story/story group managed any free recall, and they were very disjointed. This is not really surprising, because the story was very long for children of four years old, and it did not have a classic story structure.

Returning to the event/story group, the small improvement in numbers conceals an impressive *qualitative* improvement in performance. The narratives are better structured and a lot more detail is included. Here is an example of the first child we saw earlier. Previously, she had recalled quite a lot, but in four bits, and had required prompting throughout.

> s1. Helen was reading a hungry snake book and someone knocked on the door and then she said, "Hello children" and she said, "I am Wanda the witch" and she said, "Go office when you've washed your hands and see the owl" ... and the witch said bathroom, higgledy piggledy and Wanda the witch took the cats off the mats and then we had a little run, play, run out the garden.

This child uses "we" in the narrative. Other children use "I", indicating that they had identified with the story. More important is the way in which information from a number of episodes is strung together. This happened with five of the seven children. The form of the responses is diagrammed in Figure 2. Notice that the same limitation as before seems to hold in that it is rare for more than two items to be mentioned from any one episode. In addition, recall is in the correct order with the exception of two subjects who recall Julie and the owl before the bathroom.

What is happening here? In terms of the HR model it is quite straight forward. During the original event, the whole system will be operating normally, the children will interpret what is happening in the light of such information as they have available, and Records will be formed normally. This will guarantee that the separate episodes will be separately represented since the three episodes will draw on different referent records. We can characterise the difficulty experienced by most children, then, as a problem in chaining from episode to episode without support from the experimenter.

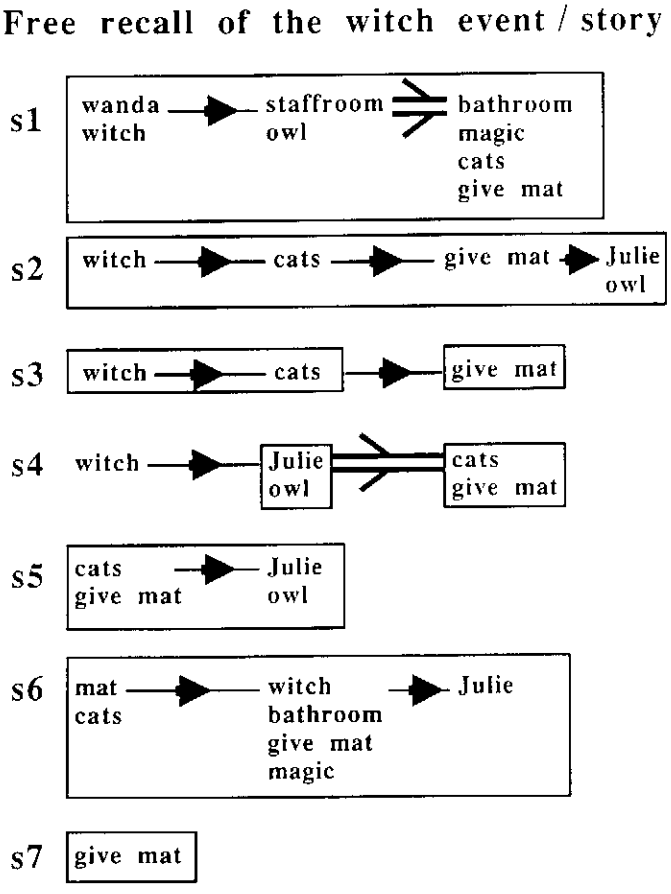
What would happen when the story was told? The normal operation of the system would be that, as the story progressed, Records would be retrieved which would help the child to interpret the story. This, too, is the normal function of the memory systems. These Records could be those of the previous questioning or the Records of the original event. In neither case would new Records be created for each episode.

The story itself would provide a natural unit for a single Record, allowing the child to produce a single coherent utterance with narrative structure.

There is evidence that the original Records were used by children in interpreting the story, namely the presence in the recall of information which the child had not recalled first time around and which did not appear in the story. Examples include recall by one child of a "magic kiss" given by the witch, and "play in the garden" in the protocol you have seen.

If we return to the retrieval cycle we can put various factors together. The first limitation is that many children, presented with the question about *yesterday* have no idea how to start the search process going. That is they cannot turn the task specification into a Description. We also saw that there was a problem in the output phase, with recall from any one episode being limited to two items in virtually all cases. Thirdly, we saw that most children had problems with the automatic formation of Descriptions from the avail-

Figure 2



able material. This meant that the children required outside support to produce more information.

We can see that the problem the young child has to face when trying to satisfy the questioning adult is quite acute. The child is placed in the position of trying to produce narrative speech from a Record which was set up for a totally different purpose. Primary Records are for USING: they get used for interpreting the world and guiding action and have a construction which is appropriate for these uses. If you try to use them for narrative it will not be efficient. There are many ways of failing to get a four-year-old to recall.

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