

Organization of Public Events in Long-Term Memory

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A model of "historical memory" is proposed. This model identifies three primary levels of organization (the news event, the public narrative, the historical period) and allows public events to be associated with personal information. Three experiments were conducted to evaluate this model: a verbal protocol study, a response time study, and a free-association study. In accordance with the model, these studies demonstrated that (a) associations between same-narrative events tend to be stronger than other interevent associations, (b) political events are more likely to be related to accessible historical periods than are nonpolitical events, and (c) public events are often stored with accessible personal information. These studies also indicated that (d) political events are more likely than nonpolitical events to be embedded in public narratives and (e) nonpolitical events are more likely than political events to be associated with personal information.

Exposure to news reports is a common, almost inevitable part of daily life (Schulz, 1982). Typically, the public events described in news reports are either ignored or rapidly forgotten (Booth, 1970; N. R. Brown, Rips, & Shevell, 1985; Graber, 1984; Neuman, 1976). Yet facts about some events, generally the most important and the most widely publicized, are gleaned from news reports and stored in long-term memory (Johnson & Klingler, 1976; Warrington & Sanders, 1971; Warrington & Silberstein, 1970). This catalog of facts, referred to throughout this article as *historical memory*, has many uses; knowledge of the recent past can affect discourse comprehension (Findahl & Hoijer, 1985; Larsen, 1983), learning (Clifton & Slowiaczek, 1981; Findahl & Hoijer, 1982, 1985; Gaziano, 1983; Graber, 1984; Schustack & Anderson, 1979; Tichenor, Donohue, & Olien, 1970), problem solving (N. R. Brown et al., 1985; Friedman & Wilkins, 1985; Voss, Greene, Post, & Penner, 1983), decision making (Iyengar & Kinder, 1987; Lewis-Becker & Rice, 1982; Sigelman, 1979), and opinion formation (Combs & Slovic, 1979; Graber, 1984; Iyengar & Kinder, 1987; Iyengar, Peters, & Kinder, 1982; McCombs, 1981; McCombs & Shaw, 1972). Moreover, because governments and politicians often respond to the public's opinions (expressed in surveys) and decisions (expressed at the polls),

the popular conception of public events can play an important, if indirect role in shaping future events.

My primary aim is to identify the concepts and relations that characterize the content and structure of historical memory. This issue is important because complex cognitive tasks such as discourse comprehension and problem solving are affected by the structure of the relevant knowledge base, as well as by the processes that operate on those structures (Anderson, 1983; Chi, Glaser, & Rees, 1982; Collins, 1978; Collins & Loftus, 1975; Reiser, Black, & Abelson, 1985). Thus a thorough understanding of the many high-level activities affected by knowledge of the recent past depends on an empirically valid model of the historical memory.

A model of historical memory is proposed in the next section. According to this model, knowledge of the recent past consists largely of facts about specific public events and the relations that hold between those events. In particular, I argue that causally related events often cluster in memory to form more or less discrete *public narratives*. In turn, these public narratives may be related to *historical periods*. The model also acknowledges that a public event may be associated with other public events through similarity and that people may encode facts about the context in which they learned about a particular event along with facts about the event itself. This model is evaluated in the three experiments to be presented.

To take a concrete example, consider Lieutenant Colonel Oliver North's dismissal from his position with the National Security Council. This event was prompted by the revelation that North had played a major role in the Iran-contra affair. It was accompanied by the resignation of the National Security Adviser, Admiral John Poindexter, and it set the stage for North's dramatic testimony before the Select Congressional Committee. According to the current theory, facts about North's dismissal would be stored with facts about other related events (the Iranians received three shipments of TOW anti-aircraft missiles, one American hostage was released, profits from the arms sales were diverted to the Contra rebels fighting in Nicaragua, etc.). This set of events is assumed to form a cohesive, complex unit in memory. Because these events took place during President Ronald Reagan's term of

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office, the current theory predicts that people will consider the Iran-contra affair to be part of a historical period defined by Reagan's tenure as president. Finally, the assumption that personal information is often encoded with information about public events implies that people may be reminded of their own activities during 1986 and 1987 when they consider the Iran-contra affair.

Narrativelike structures are not the only ones that could be used to organize knowledge of real-world events. Indeed, a number of researchers have proposed that real-world events are organized around central concepts, rather than embedded within narrative contexts. For example, Schank and his colleagues (Kolodner, 1983a, 1983b; Lebowitz, 1983a, 1983b; Reiser, 1983; Reiser et al., 1985; Reiser, Black, & Kalamarides, 1986; Schank, 1982) have developed a detailed theory in which event categories serve the primary organizational function. According to this approach, North's dismissal would be stored in memory with other politically motivated resignations (e.g., those of Andrew Young, Cyrus Vance, and James Watt), but it would be only indirectly (i.e., inferentially) related to other important Iran-contra events. Others (Clifton & Slowiaczek, 1981; Hastie & Kumar, 1979; Srull, Lichtenstein, & Rothbart, 1985; Srull & Wyer, 1989) have proposed that events are organized around "person concepts." In a person-based theory, the events and facts that directly concern Oliver North would be subsumed by a single "Oliver North node," but, as with the event-category theory, these events would not be directly associated with Iran-contra events that did not involve North.

Elements of Historical Memory

The Basic Unit: The Event

In the current model, memorable public events are represented as unique *event units*. Each event unit is composed of a number of *event components* that specify the event's basic properties—that is, the action that took place, the identities and roles of the participants, the location of the action, and perhaps one or two particularly salient details (Findahl & Hoijer, 1975, 1982, 1985; Larsen, 1983). For example, according to the current theory, the murder of John Lennon should be represented by an event unit identifying Mark David Chapman as the murderer, Lennon as the victim, a handgun as the weapon, and New York City as the location.

Prior research in autobiographical memory (Robinson, 1976; Rubin, 1982; Wagenaar, 1986) suggests that at least some event components are directly associated with corresponding concepts in semantic memory (Collins & Loftus, 1975). These links serve as retrieval indices, allowing access to a particular event from a particular concept. Thus if the event unit constructed to represent John Lennon's murder were directly linked to the specific concept *John Lennon* and to the general concept *murder*, this unit might be recalled when either concept is considered, and it should be recalled when both concepts are considered. Because a concept can be associated with a number of different units, events that share

components are indirectly related through their connections to their common concepts. Thus the node representing Lennon's murder would be indirectly related to other facts known about Lennon through the *Lennon* node and to other murders through the *murder* node. As this example illustrates, the notion of a multiply indexed event unit encompasses both action-based and person-based organizations and also allows other classes of information to serve an indexing role.

Public Events and Public Narratives

The public events most likely to be remembered are those that warrant extensive media coverage and elicit a great deal of public interest (Booth, 1970; Schulz, 1982). Such events rarely occur in isolation. Rather, they tend to be embedded in a complex web of causes and consequences, and these causes and consequences often manifest themselves as other well-publicized events. For example, the assassination of Benigno Aquino in the summer of 1983 led to the trial and acquittal of General Fabian Ver. This, in turn, resulted in a series of massive protests that forced the Philippines President Ferdinand Marcos to call a national election. Evidence of a rigged election led to further protests, and these protests were followed by a military rebellion headed by Juan Ponce Enrile and Fidel Ramos. Ultimately, this rebellion resulted in the exile of Marcos and the inauguration of Corazon Aquino as president.

It has been proposed (Larsen, 1983; van Dijk, 1984; van Dijk & Kintsch, 1983) that people form complex memory structures from their knowledge of ongoing news stories and that these structures are augmented with new information as relevant events unfold and are reported in the news media. These knowledge structures, referred to as *public narratives*, identify the story's major events and capture the causal (and the hierarchical) relations that hold between events that constitute the narrative. There are two primary reasons for hypothesizing that people construct narrativelike representations to encode their knowledge of recent public events. First, it appears that newsworthy public events are often unpredictable; at the time, who could have imagined that the assassination of Benigno Aquino would have led to the inauguration of his widow or that the release of an American hostage in Lebanon was in some way connected to the funding of the Nicaraguan rebels? The fact that public events are frequently related to one another in unique ways implies that historical events will often be difficult, if not impossible, to reconstruct from a general knowledge of events and event sequences. Prestorage is the obvious way to overcome this difficulty; a person who explicitly encodes the relations that hold between a news story's major events should form an accurate, stable, and readily accessible representation of that story.

The second reason why people may create narrative representations to organize their knowledge of public events is the existence of a general episodic pattern common to news stories and fictional narratives. In both cases, one often finds human (or institutional) agents acting deliberately to achieve goals that conflict with the goals of other agents. It is also common to find that actions on the part of one party lead to reactions on the part of others (Black & Bower, 1980; Mandler &

Johnson, 1977; Rumelhart, 1975; Stein & Glenn, 1979; Trabasso & van den Broek, 1985; van den Broek & Trabasso, 1986). Research in story comprehension indicates that the interpretation of complex event sequences requires people to engage a causal inference process (Graesser, Robertson, & Anderson, 1981; Trabasso, Secco, & van den Broek, 1984; Trabasso & Sperry, 1985). This process, which draws on general knowledge, story knowledge, and naive theories of psychology and physical causality, yields an understanding of how a particular event is related to other events. People encode this understanding by constructing *causal links* between related events and, in so doing, develop networklike story representations (Graesser et al., 1981; O'Brien & Myers, 1987; Trabasso et al., 1984; Trabasso & Sperry, 1985; Trabasso & van den Broek, 1985). If people use the same inference process to understand news stories that they use to understand conventional stories, they will construct networks that link causally related news events to one another. Moreover, the process of constructing public narratives should be facilitated by the journalistic practice of including background material in the bodies of most news reports. This should remind (or inform) the reader of the prior events that are necessary to understand and encode a news report's main event as a narrative episode.

Also, a growing body of research indicates that autobiographical events may be organized in narrativelike structures (Barsalou, 1988; Bradburn, Rips, & Shevell, 1987; Fitzgerald, 1980; Huttenlocher, Hedges, & Bradburn, 1990; Linton, 1986; Reiser, 1983; Reiser et al., 1986; Wagenaar, 1986; Wyer, Shoben, Fuhrman, & Bodenhausen, 1985). There is also evidence that jurors attempt to construct narratives from courtroom testimony (Pennington & Hastie, 1986, 1988). This work is important because it provides a clear demonstration that people are capable of perceiving and encoding connections between causally related events, even when those events are separated in time and encountered outside of a conventional story format.

Historical Periods

The most general level of organization in historical memory is that of the *historical period*. The notion of a historical period is intended to capture the intuition that historical events cluster both thematically and temporally in the same way that personal events do (Conway & Bekerian, 1987; Huttenlocher, Hedges, & Prohaska, 1988; Linton, 1986; Reiser, 1983; Reiser et al., 1985; Robinson, 1986). It is assumed that historical periods exist as distinct memory units and are defined by a small set of temporal and thematic features. For an event or narrative to be part of a particular period, it must have happened during the temporal range specified by the period, and it must share a number of the period's defining features. The relationship between period and period member may be prestored or readily inferred from the content of the member. This definition leaves open the possibility that people maintain many temporally overlapping public and personal periods.

In the experiments to be described, public periods were identified with the terms of U.S. presidents for two reasons:

First, within the sphere of U.S. politics and foreign policy, presidents and their administrations play an active and direct role in most important events. Even those international events that do not have an immediate effect on the interests of the United States often elicit a concrete and memorable response from the administration. Because of this, people should often be able to access a political event's historical (presidential) period by identifying the public figures who participated in that event or in other closely related events.

The second reason to equate historical periods with presidential administrations is a practical one. Most of the university students who participated in my experiments were born in the 1960s. In order to ensure that these subjects were old enough to have learned about the events when they happened, it was necessary to restrict the set of events to those that took place from 1976 to 1984. This 8-year period seems to have lacked the major social and political upheavals that may have defined public periods in other decades (e.g., the Depression, World War II). As a result, the presidential administrations may be the only element unifying national and international affairs.

There are, of course, events such as the Bhopal, India, chemical disaster or the death of Cary Grant that do not directly involve the federal government or elicit a well-publicized governmental response. Because such events can be understood without reference to the current political context, there should be little reason or opportunity for people to relate these events to a public period defined by a presidential administration. However, such events may be related to personal periods or to public periods defined by other sorts of features.

Public Events and Autobiographical Events

Up to this point, the discussion of historical memory has focused on how people organize their knowledge of contemporary history. One important aspect of historical knowledge is clearly its public or shared nature, but there also is a personal side to this knowledge. In general, historical knowledge is acquired secondhand: People learn about current events by reading stories in the newspaper, by listening to them on radio, by viewing them on television, or through discussions with other people (Roberts & Bachen, 1981). When one learns about or discusses a public event, one is engaged in a personal activity, and such activities can be treated as distinct events and stored as unique autobiographical memories. According to the model, memory traces may be laid down by these "informative events." These traces are seen as a composite of public and autobiographic information, whereby a news story's factual content serves as the trace's "focal element," and its environmental, social, and affective context serve as its "setting" (Tulving, 1983). Put more simply, the model assumes that there are *contextual links* that directly connect facts derived from news stories to facts about the personal context in which they were acquired or used. It is through these links that the contemporaneous but generally distinct domains of autobiographical memory and historical memory are coordinated (Neisser, 1982).

Research on “flashbulb memories” (R. Brown & Kulik, 1977; McCloskey, Wible, & Cohen, 1988; Pillemer, 1984; Winograd & Killinger, 1982; Yarmey & Bull, 1978) provides strong evidence that people do store contextual facts when they encode information for some public events. These studies have demonstrated that people can recall, in vivid detail, the circumstances in which they first learned about particularly surprising or important public events (e.g., the assassination of John F. Kennedy). Two date-estimation experiments (Friedman & Wilkins, 1985; Lieury, Aiello, Lepreux, & Mellet, 1980) provided further evidence for this position. In these studies, people were asked to write down the information that came to mind as they estimated dates for well-known public events. In both experiments, subjects frequently reported autobiographical events or facts. This indicates that people make use of the hypothesized link between personal and public knowledge even when the task does not explicitly call for the retrieval of the autobiographical information.

Summary

The model presented in this section has identified a number of concepts that may characterize the content and structure of historical memory. The starting point of this model is the contention that much of people’s knowledge of contemporary history concerns specific, well-publicized events. The memory units constructed to represent these events are embedded in a rich network of associations. This network has both a hierarchical aspect (Linton, 1986; Neisser, 1986) and a non-hierarchical aspect. The hierarchical aspect of the model is portrayed in Figure 1. Here, the individual events that make

up the content of an ongoing news story (e.g., the Aquino revolution) are drawn together to form a distinct public narrative, and events and narratives that share certain temporal and thematic features are related to common historical periods (e.g., the Reagan years).

Event units themselves can be associated in a number of ways. First, an event unit may be directly associated with other event units by means of causal links. “Same-narrative” events may also be indirectly related through a common higher order narrative node and through links to shared concepts. Events that are not members of the same narrative generally are not directly linked to one another. However, they may be indirectly linked when they share common concepts or when they are subsumed by the same historical period. Finally, the model allows for the possibility that people form associations between specific public events and the personal contexts in which those events were encountered.

Experiment 1

The model of historical memory described in the last section presupposes that people construct memory units to encode their knowledge of public events, that these units are embedded in a rich network of associations, and that this network has systematic properties (i.e., event units are frequently associated with some types of information, but not with others). One way to evaluate this sort of model is to present subjects with a set of public events and have them think out loud as they perform a task that requires them to make extensive use of their historical knowledge but does not necessarily favor one type of knowledge over another. The

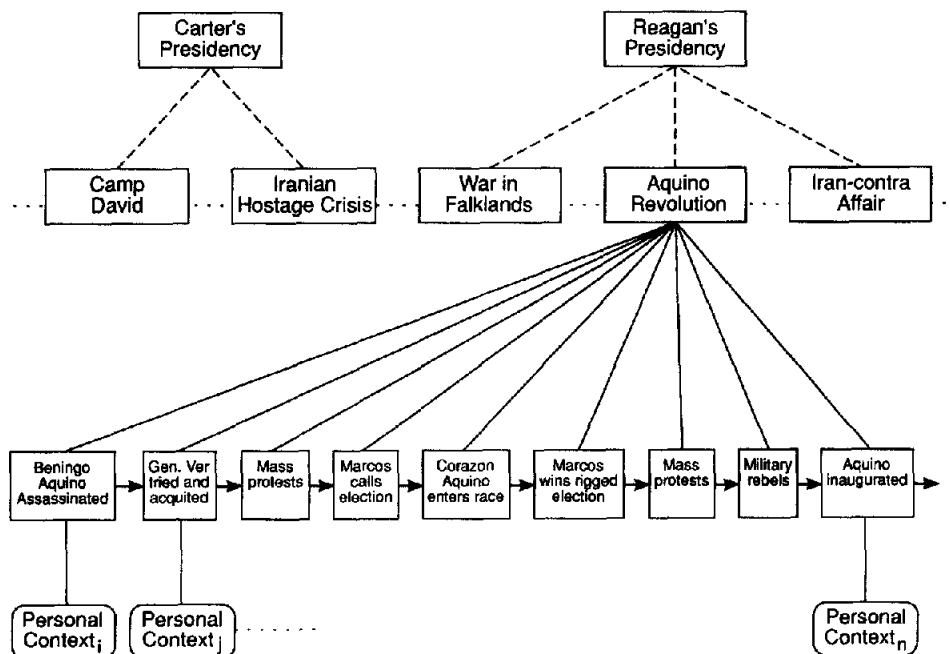


Figure 1. A simplified fragment of historical memory illustrating the relations between historical periods, public narratives, event units, and personal contexts. (The unbroken lines indicate an associative relation between units, and the dashed lines indicate either an associative or inferred relation.)

facts contained in these verbal protocols can then be classified, and the relative frequency of these classes can be taken as an index of the frequency with which event units are associated with different types of information.

In keeping with this rationale, subjects in Experiment 1 thought aloud as they estimated dates for recent public events. This particular task was selected because it seemed likely to elicit an open-ended but representative sample of current-event knowledge. This expectation was based on research indicating that dates are typically "reconstructed" rather than recalled (Baddeley, Lewis, & Nimmo-Smith, 1978; N. R. Brown et al., 1985; Ferguson & Martin, 1983; Friedman, 1987; Friedman & Wilkins, 1985; Linton, 1975; Means, Nigam, Zarrow, Loftus, & Donaldson, 1989; Thompson, 1982; Thompson, Skowronski, & Lee, 1987). When reconstructing dates, people retrieve facts from memory and draw "temporal inferences" (Collins, 1978). These inferences help narrow the range of years or the time of year during which a target event could have occurred. For example, a person attempting to date the overthrow of the Shah of Iran might recall that this event happened during Jimmy Carter's presidency. This fact, combined with the knowledge that Carter held office from 1977 to 1981, implies that the shah must have been overthrown during this period.

The reconstructive process involved in date estimation and in other knowledge-based problem-solving tasks consists of a cycle of retrieval and inference (Collins, 1978; Collins & Michalski, 1989; Norman & Bobrow, 1979; Williams & Hollan, 1981). In date estimation, the reconstructive process begins with accessing the target event. Then a fact related to the event is retrieved and evaluated. If the retrieved fact is temporally informative, its implications are derived, and an inferred temporal range is updated. Otherwise, the fact is discarded, the target event is reaccessed, and another fact is retrieved. Typically, a single fact, short of the event's calendar date, will not provide enough information to allow a person to infer an event's precise date. As a result, this cycle may be repeated many times, terminating when a precise date has been inferred, when a time limit has been reached, or when all readily available facts have been evaluated. It is possible that date reconstruction is begun only when people fail to recover a calendar date for the target event. However, because explicitly encoded dates are rare (N. R. Brown et al., 1985; Underwood, 1977), date reconstruction should be common (Baddeley et al., 1978; Friedman, 1987; Friedman & Wilkins, 1985; Means et al., 1989; Thompson et al., 1987). Therefore, protocols collected in this experiment should frequently contain one or more supporting facts.

The facts contained in dating protocols were used as evidence concerning the organization of public events in long-term memory. This somewhat unorthodox treatment of protocol data (cf. Ericsson & Simon, 1980) is justified on the following grounds. First, it is assumed that an opportunistic retrieval process supports date reconstruction—that is, that the retrieval process recovers those facts that are most readily available, regardless of their content (Collins & Michalski, 1989; Kintsch, 1988; Raaijmakers & Shiffrin, 1981). Second, it is assumed that the availability of a given fact at the beginning of a retrieval cycle is determined, in part, by the

strength of the association between that fact and the target event. This implies that retrieved facts will often be highly associated with the target event. Finally, it is assumed that event units are embedded in an associative network with systematic properties. It follows that the facts mentioned in the protocols should reflect those systematic properties. Thus an accurate model of historical memory should predict the types of facts that people will retrieve when they reconstruct dates for public events.

One of the central assumptions of the current model was that well-known public events are often embedded in narrative frameworks. This implies that associations between events subsumed by the same narrative should be stronger, more common, and more direct than other types of interevent associations; that is, associations that might exist between similar but causally unrelated events. If this is correct, events belonging to the target event's narrative should be recalled more often than other types of public events.

Another contention made earlier was that facts about public events are often stored with information about the personal context in which those facts were learned or used. Personal information should be useful to the dating process because it would allow subjects to tie the target event to a personal chronology composed of a relatively detailed and well-structured set of temporal facts (Friedman & Wilkins, 1985; Huttenlocher et al., 1988; Lieury et al., 1980; Linton, 1975; Loftus & Marburger, 1985; Reiser, 1983; Reiser et al., 1986; Robinson, 1986). Because personal facts should be useful to the dating process, and because they are assumed to be fairly common, one would expect them to show up frequently in dating protocols.

Historical periods were a third aspect of the proposed model investigated in Experiment 1. As mentioned earlier, contemporary historical periods were identified with presidential terms. Public events that directly or indirectly involved the federal government were expected to be related to these presidential periods, whereas public events that did not involve the federal government were not. In order to assess these expectations, two types of items were included in this experiment. Half of the events that the subjects dated were *political events*, such as the invasion of Afghanistan or the resignation of Secretary of State Cyrus Vance, and half were *nonpolitical events*, such as the Jonestown suicides or the first Mount St. Helens eruption. The prediction was that subjects would make more frequent reference to presidential periods when dating political events than when dating nonpolitical events because presidential information should be more available for the former than for the latter.

One final point concerns dating performance. Typically, when subjects date real-world events, there is a strong correlation between true dates and estimated dates, a relatively small average absolute error, and a relatively small proportion of "correct" responses—that is, responses in which the year and the month when the target event occurred are correctly identified (N. R. Brown et al., 1985; Underwood, 1977). It is also common to find that accuracy reflects the age and the salience of the events being tested (Baddeley et al., 1978; N. R. Brown et al., 1985; Friedman & Wilkins, 1985; Huttenlocher et al., 1988, 1990; Linton, 1975; Thompson, 1982);

other things being equal, recent events are dated more accurately than older events, and well-known events are dated more accurately than obscure events. If the requirement to verbalize does not affect the dating process, dating performance in this study should follow this general pattern.

Method

Materials. The 32 news events that served as target items in this experiment (see Table 1) included 8 events from each year between 1978 and 1981. Half of the events selected were political in nature, and half were nonpolitical. The political events included national events that directly or indirectly involved the federal government and international events of a political or military nature. Nonpolitical events had no obvious relation to national or international affairs. Events were selected so that event age and prior level of knowledge balanced across event type. On average, the political events had occurred 3.26 years before the time when this experiment was conducted, and the nonpolitical events had occurred 3.30 years before. A group of pilot subjects gave the political events a mean knowledge rating of 5.30 on a scale of 0 (*no knowledge*) to 9 (*a great deal of knowledge*). The nonpolitical events received a mean knowledge rating of 5.23.

Table 1
Event Descriptions Used in Experiment 1

Date	Event
Political events	
March 1978	U.S. signs Panama Canal Treaty.
September 1978	Camp David Peace Accord signed.
October 1978	Congress extends the ERA deadline.
October 1978	Sadat and Begin win the Nobel Prize.
January 1979	Khomeini overthrows the Shah of Iran.
June 1979	U.S. and Soviets sign SALT agreement.
August 1979	Andrew Young leaves U.N. post.
December 1979	Soviets invade Afghanistan.
April 1980	Secretary of State Cyrus Vance resigns.
July 1980	U.S. boycotts the Moscow Olympics.
September 1980	U.S. sells AWACs to Saudis.
September 1980	Iraq initiates Iranian War.
May 1981	François Mitterrand becomes French Premier.
August 1981	U.S. downs two Libyan jets.
October 1981	Anwar Sadat assassinated.
December 1981	Martial law declared in Poland.
Nonpolitical events	
April 1978	"Holocaust" aired for the first time.
June 1978	"Son of Sam" convicted.
July 1978	First test-tube baby born in England.
November 1978	911 die in Jonestown suicides.
March 1979	Three Mile Island Accident occurs.
July 1979	Skylab falls from orbit.
October 1979	Mother Theresa wins Nobel Prize.
December 1979	Eleven fans die at the "Who" concert.
January 1980	Paul McCartney arrested by Japanese police.
March 1980	First Mount St. Helens eruption.
November 1980	80 die in Las Vegas hotel fire.
December 1980	John Lennon murdered by Mark David Chapman.
April 1981	First Space Shuttle launched.
July 1981	Prince Charles marries Diana Spencer.
July 1981	125 people die in Kansas City Hyatt disaster.
January 1982	AT&T forced to break up.

Procedure. At the beginning of the session, subjects were told that the descriptions they would be seeing referred to unique events that happened between January 1976 and "the present" (May 1983). Subjects were asked to estimate the month and year during which each event took place and to make an educated guess when they could not come up with a precise answer. Subjects were also instructed to think out loud as they decided on a reasonable estimate and were told that they would be prompted if they fell silent for more than a few seconds. Beyond this prompting, subjects received no feedback. Each subject received a booklet in which the descriptions of the events were typed, one to a page, and the events were randomized separately for each subject.

Before subjects were presented with the experimental events, they were given six practice trials. The procedure for the practice events was the same as that for the experimental events, except that subjects were prompted more often. The responses to both the practice events and the experimental events were tape-recorded, and the responses to the experimental events were transcribed.

When the subjects completed the protocol phase of the experiment, they received a knowledge rating form containing the 32 event descriptions, printed in a random order, 8 to a page. The subjects were instructed to indicate how much they knew about each event on a scale of 0 (*no knowledge* of the event in question) to 9 (*a great deal of knowledge*).

Subjects. Fifteen subjects participated in this study. All were recruited from the University of Chicago community by an advertisement in the university paper, and their ages ranged from 23 to 30. Subjects were tested individually in sessions that lasted 30–50 min, and they were paid \$3.50 for their participation.

Results

Dating performance and knowledge ratings. As in prior studies (e.g., N. R. Brown et al., 1985; Linton, 1975; Thompson, 1982; Underwood, 1977), the protocol subjects rarely responded with both the correct month and the correct year; such accurate responses occurred only 8% of the time. Despite the low hit rate, dating performance was quite good; there was a strong correlation (.83, $p < .001$) between the events' true dates and their mean estimated dates, and the mean absolute error was fairly small (.98 of a year). There were also strong correlations between the knowledge ratings and the mean absolute error ($-.56$, $p < .001$) and between the true dates and the absolute error ($-.62$, $p < .001$). Event type had no effect on dating accuracy or knowledge ratings. For political events, the mean absolute error was .97 of a year, and the mean knowledge rating was 3.80. For nonpolitical events, the means were 1.00 of a year and 3.49 for absolute error and knowledge, respectively. These differences yielded *F*s of less than 1.0 for both subjects and items when the means were submitted to the appropriate analyses of variance (ANOVAs).

Protocol analysis. Each protocol response was coded for the presence of the following information: (a) *specific temporal facts*, which contained information about the target event's duration or age but not its exact date; (b) *general temporal facts*, which allowed subjects to infer some aspect of the target event's temporal character from the fact that it is an event of a certain type; (c) *presidential references*; (d) references to public events that were members of the target event's narrative (i.e., *same-narrative events*); (e) references to public events that were not members of the target event's narrative (i.e., *nonnarrative events*); and (f) *contextual information*, which

included references to autobiographical events and facts, as well as references to specific news reports. Responses containing samples of each of the reference types are presented in Table 2. The second, third, and fifth examples illustrate that although these six response categories were mutually exclusive, a given response may have included facts from more than one of them. As a check on the reliability of this coding scheme, a naive judge rescored 60 responses (4 per subject). For this sample, the judge and I agreed 92% of the time on response coding.

Four predictions were made concerning the contents of the dating protocols. The first was that subjects would frequently justify their responses with reference to one or more auxiliary facts. In order to evaluate this prediction, each response was classified as being either *justified* or *unjustified*. A response was considered to be justified when the subject mentioned information that fell into at least one of the six reference categories. Responses that did not include such information were considered to be unjustified (see Table 2, Example 7). As predicted, justified responses (78%) vastly outnumbered

Table 2
Protocols Containing Examples of the Reference Types Coded in Experiment 1

Target event	Response
"Congress Extends ERA Deadline"	<p>Specific temporal knowledge</p> <p>That was <i>three years before last June</i>. . . . So, it would have been about June of '79.</p>
"Sadat and Begin Win the Nobel Prize"	<p>General temporal knowledge</p> <p>Sadat and Begin must have won the Nobel prize before Sadat's death and after Camp David. Taking the average, I would say probably 1978. <i>I assume the Nobel Prize is announced in the winter because it's sort of an August kind of thing.</i> Summer's too frivolous. October of 1978.</p>
"Secretary of State Cyrus Vance Resigns"	<p>Presidential reference</p> <p><i>That was in the Carter administration.</i> So it had to be between the periods of 1977 to '81. And it was fairly far along in his administration, as well, if I recall. I think that it was in the last year of his administration, during the Iran situation. I would think for that reason, and I also seem to recall that this event happened around the middle of the year; maybe May or June. So I would say May of 1980.</p>
"Khomeini Overthrows the Shah of Iran"	<p>Same-narrative event</p> <p>So, I'm trying to remember when the. . . <i>the embassy was overtaken</i>. . . . I know that, let's see, <i>the hostages were released</i>. . . the, right at the beginning of '81. About. . . November of '79.</p>
"Iraq Initiates Iranian War"	<p>Nonnarrative event</p> <p>Let's see. I think, that was, I was traveling in Europe, and that was. . . about a year ago, in June, <i>that they bombed the nuclear reactor in Iraq.</i> Somebody bombed, no the, the Israelis. . . well, it was about the same time anyway. So I'd say June of 1982.</p>
"Space Shuttle Launched"	<p>Contextual and autobiographical information</p> <p><i>I was sitting in a barber shop when that happened, watching it, and I was living in another locale. That was before I moved out here, which was in September of '80 that I moved out here.</i> So I would say it would have been in June of 1980 because I seem to recall it was a couple months before that, and <i>it was warm, I was wearing a short-sleeved shirt at the time.</i></p>
"U.S. Downs Two Libyan Jets"	<p>Unjustified response</p> <p>Trying to. . . I'm just trying to place this thing. . . and I can't exactly. Seems to me that I should be able to, but I can't. . . . So I would say. . . that this happened. . . in the middle of 1980. So, I'll say April of 1980.</p>

Note. Italicized statements indicate the portion of the response relevant to the reference type classification.

unjustified responses (22%); 14 of 15 subjects provided justifications for the majority of their responses ($p < .01$). (All confidence levels reported in this section are based on two-tailed sign tests.) This pattern held across event type; 82% of the political responses and 73% of the nonpolitical responses were justified.

The three other predictions concern the contents of the justified responses. Data relevant to these predictions are listed in Table 3. The entries in this table represent the proportion of responses that included one or more facts of a given reference type. The first prediction for the justified responses was that references to same-narrative events should be more common than references to other sorts of public events. As predicted, subjects mentioned same-narrative events (21%) more often than they mentioned nonnarrative events (13%; $p < .01$). A second prediction was that subjects would frequently use contextual information to support their date estimates. The results listed in Table 3 indicate that this prediction was also correct; 48% of the responses included at least one contextual fact, and so contextual information was by far the most common response category. Of 14 subjects, 12 mentioned contextual information more often than any other type of information ($p < .05$). The final prediction was that political events would elicit more presidential references than would nonpolitical events. Again, the prediction proved to be correct; presidential references appeared in 35% of the political responses events and in only 4% of the nonpolitical responses. Fourteen subjects displayed this pattern ($p < .01$).

Not only did event type affect the frequency of presidential references; it also affected the frequency with which same-narrative events and contextual facts were retrieved. Subjects retrieved same-narrative events more often when dating political events (32%) than when dating nonpolitical events (9%; $p < .01$). In contrast, they retrieved more contextual information when they dated nonpolitical events (59%) than when they dated political events (38%; $p < .01$).

Discussion

To summarize, verbal protocols were collected from 15 subjects as they estimated dates for 32 public events. Overall, the estimates were reasonably good, but not perfect; that is, although there was a strong correlation between true date and mean estimated date, subjects rarely provided responses that included both the correct month and the correct year. These

findings are consistent with those observed in prior event-dating experiments (e.g., N. R. Brown et al., 1985; Underwood, 1977) and indicate that thinking aloud did not interfere with subjects' ability to perform the dating task. Moreover, subjects in this experiment mentioned auxiliary facts in most of their responses (78%). This too is consistent with earlier findings (e.g., Baddeley et al., 1978; Friedman, 1987; Friedman & Wilkins, 1985; Thompson et al., 1987) and provides additional evidence that people often reconstruct dates for real-world events.

A content analysis performed on the protocols addressed several aspects of the proposed model of historical memory. First, the assumption that interevent associations are dictated primarily by the narrative relations was supported by the finding that subjects referred to same-narrative events more often than they referred to nonnarrative events. Second, the assumption that events are often encoded with contextual information was supported by the large proportion of responses that included autobiographical facts. Finally, the finding that presidential references were common when subjects dated political events and uncommon when they dated nonpolitical events supports the notion that historical periods exist as units in memory and that they are readily accessible from some events but not from others.

The content analysis also revealed that event type affected the retrieval of same-narrative events and contextual information; political events elicited more same-narrative events than did nonpolitical events, and nonpolitical events elicited more contextual information than did political events. These findings suggest that (a) political events are more likely to be episodes in ongoing public narratives than are nonpolitical events and (b) personal information is more likely to be stored with nonpolitical events than with political events. In retrospect, the first of these conclusions seems quite reasonable. This is because events classified as political (wars, elections, negotiations, etc.) tend to involve two or more goal-directed parties in an adversarial relation. In such situations, an action initiated by one party often provokes a reaction from the other. As a result, well-publicized political events often result from and result in other equally well-publicized events. In contrast, well-publicized nonpolitical events seem to stand in isolation. Even when an event such as the Three Mile Island accident or the Kansas City Hyatt disaster results in a number of follow-up events (i.e., investigations, lawsuits), these subsequent happenings are rarely given the same amount of media attention as the events that initiated them. This question of event type and narrative membership is considered further in Experiment 3.

The finding that event type influences the retrieval of personal information is more problematic. One explanation is that nonpolitical events are more likely to be associated with retrievable contextual information than are political events. Thus the observed difference in the retrieval of contextual facts directly reflects an underlying difference in the availability of contextual information. There is, however, an alternative explanation: It might be that political events and nonpolitical events are just as likely to be encoded with retrievable personal information, but that political events are more likely to be associated with retrievable public informa-

Table 3
Proportion of Responses Including at Least One Fact of a Given Reference Type in Experiment 1

Reference category	Event type		M
	Political	Nonpolitical	
Contextual	.37	.59	.48
Presidential	.35	.04	.19
Same-narrative event	.32	.09	.21
Nonnarrative event	.12	.13	.13
Specific temporal facts	.07	.08	.07
General temporal facts	.05	.05	.05

tion. Under these conditions, subjects should recall more personal information when they date nonpolitical events because they have access to fewer potentially useful public facts.

Experiment 2

In Experiment 1, subjects retrieved contextual information more often when they dated nonpolitical events than when they dated political events. Two explanations were offered for this finding. According to the first, this difference reflects an underlying difference in the probability that political and nonpolitical events are stored with retrievable personal information. In contrast, the second explanation assumes that event type does not affect the likelihood that people will encode and retain contextual information. According to this view, the observed difference is attributed to the greater number of public facts associated with political events. Experiment 2 was designed to distinguish between these two explanations.

In this experiment, subjects were timed as they decided whether a target event occurred during the earlier or the later of two consecutive temporal periods. The experimental design included two types of periods, *personal periods* (the years during which the subjects were in high school vs. the years during which they were in college) and *public periods* (the years of Carter's presidency vs. the years of Reagan's presidency), and two types of events, *political* and *nonpolitical*. All of the students who participated in this study had entered college in the fall of 1980 and were seniors when the experiment took place in the spring of 1984. Because Reagan entered office in January 1981, the temporal overlap between the personal periods and the public periods was almost perfect. Thus this experiment provided data on the speed with which subjects located political and nonpolitical events in the context of equivalent personally defined and publicly defined periods.

The period-membership task was used to test two predictions. The first prediction was that the nonpolitical-personal trials would be performed faster than the political-personal trials. In other words, it would be easier for subjects to select the correct personally defined period (i.e., high school or college) when they were presented a nonpolitical event, such as the Jonestown suicides, than when they are presented a political event, such as the Soviet invasion of Afghanistan. This result would indicate that contextual information is more readily available for nonpolitical events than for political events. The second prediction was that subjects would perform faster in political-public trials than in nonpolitical-public trials. In other words, responses to political events, such as the invasion of Afghanistan, should be faster than responses to nonpolitical events, such as the Jonestown suicides, when the periods are identified with presidents. This result would indicate that subjects associated facts related to presidential periods more often with political events than nonpolitical events. This prediction of an interaction between type of event and type of period is based on the assumption that the pattern of retrieval observed in Experiment 1 accurately reflected the underlying organization of historical memory.

Method

Materials and design. Forty public events were chosen to serve as target items in this study. Half of these items were political events, and half were nonpolitical events. Within each event type, half of the events took place between March 1978 and March 1980, and the other half occurred between March 1981 and December 1982. Target events were selected so that event age and prior event knowledge balanced across event type, and event descriptions were composed so as to balance mean word length and mean word frequency across event type (see Table 4).

Over the course of an experimental session, subjects saw the 40 event descriptions four times, once in each of four 40-trial blocks. In half of these trials, the target events appeared in conjunction with a pair of public periods, and in the other half, in conjunction with a pair of personal periods. In a public period trial, the target event was

Table 4
Event Descriptions in Experiment 2

Date	Event
Political events	
March 1978	U.S. signs Panama Canal Treaty.
September 1978	The Camp David Peace Accord signed.
February 1979	Ayatollah Khomeini takes over Iran.
February 1979	Thatcher first becomes Prime Minister.
June 1979	U.S. and Soviets sign SALT II.
August 1979	Andrew Young resigns.
November 1979	Iranian "students" take American embassy.
December 1979	Soviet Union invades Afghanistan.
January 1980	U.S. halts grain sales to Soviets.
April 1980	Secretary of State Cyrus Vance resigns post.
March 1981	American military advisors arrive in El Salvador.
June 1981	François Mitterrand elected Premier.
August 1981	Sandra Day O'Connor named to Supreme Court.
October 1981	President Anwar Sadat assassinated in Egypt.
December 1981	Polish government declares martial law.
December 1981	Red Brigade kidnaps General Dozier in Italy.
January 1982	Government forces AT&T to divide holdings.
April 1982	Argentina captures the Falklands.
June 1982	Israeli army invades southern Lebanon.
July 1982	George Shultz becomes Secretary of State.
Nonpolitical events	
October 1978	John Paul II becomes Pope.
November 1978	911 people die in Jonestown suicides.
March 1979	The Three Mile Island Accident occurs.
March 1979	Jane Byrne elected Mayor of Chicago.
May 1979	275 die in Chicago DC-10 crash.
July 1979	Skylab falls to Earth.
October 1979	Pope John Paul visits the U.S.
November 1979	Eleven die at a "Who" concert.
February 1980	John Gacy found guilty of murder.
March 1980	The first Mount St. Helens eruption occurs.
April 1981	First Space Shuttle launched.
May 1981	Pope John Paul wounded in Rome.
June 1981	Mark David Chapman convicted of Lennon's murder.
July 1981	Prince Charles marries Diana Spencer
July 1981	125 die in Kansas City Hyatt disaster.
July 1981	Professional baseball players end strike.
March 1982	"Chariots of Fire" wins the Academy Award.
March 1982	John Belushi dies.
September 1982	Seven people die in Tylenol murders.
December 1982	First artificial heart transplanted successfully.

presented on one line of a computer-controlled visual display, and the words *Carter* and *Reagan* were presented two lines beneath. In these trials, subjects had to decide whether the target event happened while President Carter was in office (January 1977 to January 1981) or while President Reagan was in office (January 1981 to "the present"—March and April 1984). In personal period trials, the words *high school* and *college* appeared on the screen beneath the target event. In these trials, subjects were to decide whether the event happened during their high school years or their college years. *High school* was defined as the period that spanned from the beginning of ninth grade until the beginning of college. *College* was defined as the period that began when subjects entered their first year in college and ended with "the present."

Period type was blocked so that subjects saw the events in conjunction with one type of period during the first half of the experiment (i.e., during the first two blocks) and in conjunction with the other type of period during the second half. Period order was counterbalanced over subjects so that half of the subjects saw personal periods during the first 80 trials, and half saw public periods during the first 80 trials. The presentation order of events was randomized separately for each subject and for each 40-item block. For Blocks 1 and 3, the left-right ordering of periods changed randomly with the constraint that periods appeared equally often on both sides of the screen for each event type. For a given pairing of event with period type, if the earlier period was on the left side of the screen during the first presentation, it appeared on the right during the second.

Procedure. In each trial in this experiment, a target event (e.g., Soviet Union invades Afghanistan) and two temporal periods (e.g., Carter's and Reagan's presidencies) were presented. Subjects were instructed to select, as quickly and as accurately as they could, the period during which the target event occurred. A bonus scheme was instituted to encourage such responses. At the beginning of the experiment, subjects were guaranteed their base pay (\$4 for the session) and were told that they could earn a bonus by being fast and accurate. Under this scheme, subjects were rewarded with 1¢ for each correct response under 10 s, and they were penalized 4¢ for every error and for every response slower than 10 s.

At the beginning of each trial, the subject sat facing the visual display with his or her left index finger resting on a button labeled "ready." This button was located on the extreme left of a four-button response panel. The subject's right index finger was on an unmarked button (the "home" button) located in the middle of the three-button cluster on the right side of the panel. To initiate a trial, the subject pressed the "ready" button. After the button was pressed, the period descriptions appeared on the screen, and a string of Xs appeared two lines above the period on the left. Subjects were instructed to read the period descriptions and to make sure that they knew which period was located on which side of the screen. Then they were to shift their gaze to the string of Xs. After 1.5 s, the Xs were erased and replaced by the target event.

When the event appeared, subjects were to read the description and decide whether the event happened during the period on the left side of the screen or during the period on the right. Subjects pressed a button labeled "L" to indicate that they thought that the event happened during the period on the left, and they pressed a button labeled "R" to indicate that they thought the event had occurred during the period on the right. The "L" button was located immediately to the left of the "home" button, and the "R" button immediately to the right. Subjects made all responses with their right index finger and returned their finger to "home" position after each trial. After each response, the screen was erased until the subject initiated the next trial.

After every 20 trials, subjects received a message telling them the number of errors they had made in the preceding set of trials and the average reaction time for their correct responses. The message also

informed subjects of the amount of bonus money they had earned in the last 20 trials and the total amount of bonus money accumulated to that point. The feedback message appeared on the screen for 10 s and then was replaced by a message telling the subject to continue the experiment.

Before the experiment began, subjects received 40 practice trials. The procedure on each practice trial was identical to the one just described except that the phrases *old period* and *new period* served as the period descriptions, and the phrases *old event* and *new event* served as event descriptions. Subjects were instructed to press the button corresponding to *old period* when the phrase *old event* appeared and to press the button for the *new period* when the phrase *new event* appeared. After the practice block, the experimenter presented the subject with a sheet of paper that listed the two periods that would appear during the first half of the experiment. After the second block, the experimenter returned to define the periods used in the last two blocks.

At the end of the session, subjects received a rating form containing the 40 event descriptions, listed 8 to a page, in a random order. Subjects indicated how much they knew about the events by rating each on a scale of 0 (*no knowledge of an event*) to 9 (*a great deal of knowledge about it*).

Subjects. The 24 subjects who participated in this experiment were 4th-year undergraduates at the University of Chicago. All subjects had entered college in the fall of 1980, and none had served as subjects in previous current-event experiments. Subjects received \$4 as the base pay for the 45-min session and whatever bonus money they earned.

Results

Figure 2 presents mean correct reaction times (RTs) for the first half (Blocks 1 and 2) and second half (Blocks 3 and 4) of

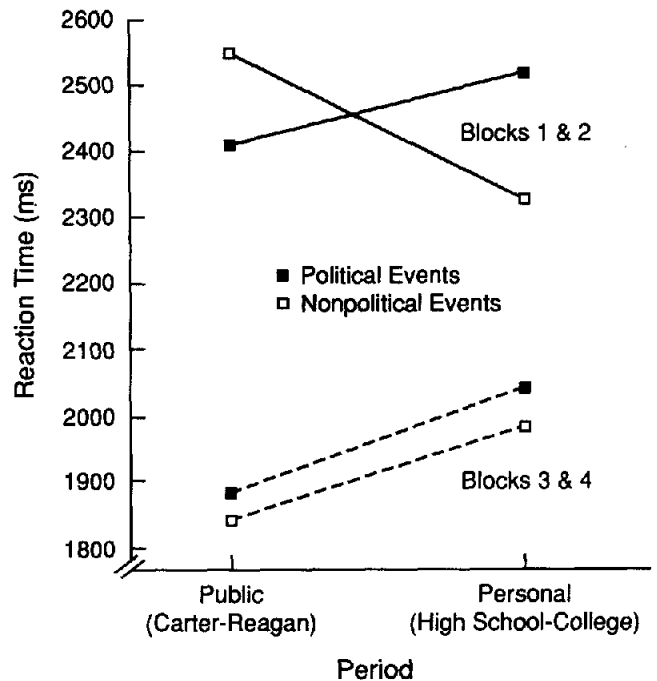


Figure 2. Mean correct reaction time as a function of period type and event type, for the first half (Blocks 1 and 2) and second half (Blocks 3 and 4) of Experiment 2.

this experiment. The data displayed in this figure suggest that subjects altered their strategies as they progressed from the first half to the second. In particular, it seems that subjects realized the extent of the temporal overlap between the two sets of periods soon after they began the second half. Having realized this, they would have been able to respond by recalling their earlier responses, thereby avoiding more complicated strategies. For this reason, data from the two halves were analyzed separately. Mean correct RT and mean error rate were computed for each combination of event type and period type for each half. In the subjects ANOVAS, the subjects variable was nested within period type, and in the item ANOVAS, the events variable was nested within event type.

Data from the first half of this experiment provided support for the two predictions made earlier: RTs in nonpolitical–personal trials (2,330 ms) were 187 ms faster than RTs in political–personal trials (2,517 ms), and RTs in political–public trials (2,410 ms) were 140 ms faster than RTs in nonpolitical–public trials (2,550 ms). This Event Type \times Period Type interaction was significant by subjects, $F(1, 22) = 9.7, p < .01$, and by items, $F(1, 38) = 4.6, p < .05$, whereas neither main effect was significant in either analysis ($F_s < 1$ in all cases). The interaction between event type and period type disappeared in the second half ($F_s < 1$ for subjects and items). Indeed, the only significant result was a main effect for period type in the items analysis, $F(1, 38) = 14.4, p < .01$ —for subjects, $F(1, 22) = 2.1, p > .01$ —which indicated that subjects who received the public periods (1,859 ms) during the second half responded faster than those who received personal periods (2,011 ms). However, the fact that public periods (23%) resulted in more errors than did personal periods (19%)—for items, $F(1, 38) = 5.0, p < .05$; for subjects, $F < 1$ —suggests that subjects in the two groups may have had slightly different response criteria. Although the error rates were fairly high in this experiment (22% for the first half and 20% for the second half), only the main effect of period type just reported reached significance. Finally, the knowledge ratings for political events (5.77) did not differ significantly from the knowledge ratings for nonpolitical events (5.29).

Discussion

Subjects in this experiment found political–public trials to be easier than nonpolitical–public trials, and they found nonpolitical–personal trials to be easier than political–personal trials. The first result provides converging evidence for the contention that political events are more likely to be related to historical (presidential) periods than are nonpolitical events. This is consistent with the notion that an event's content determines whether it will be related to a particular historical period. The second result indicates that retrievable contextual information is more readily available for nonpolitical events than for political events.

Earlier studies of news comprehension indicate that people recall nonpolitical or "human interest" stories better than other news stories (Findahl & Hojjer, 1985; Neuman, 1976). This finding suggests one reason for the differential availability of personal information. Consider a theory of memory in which event knowledge at a particular time is a function of

event age, rate of learning, and frequency of exposure. Also assume that repetition (i.e., frequency of exposure) leads to a decontextualization or a "semanticization" of the repeated materials (Barclay, 1986; Barclay & Wellman, 1986; Linton, 1982). In Experiments 1 and 2, event knowledge and event age were held constant across event type. As mentioned earlier, rate of learning appears to be greater for nonpolitical events than for political events. According to this theory, then, frequency of exposure would have to be greater for political events than for nonpolitical events. It follows from this conclusion and the assumed relation between frequency and decontextualization that facts about political events should be decontextualized to a greater extent than facts about nonpolitical events. In other words, if event age and level of knowledge are held constant, people should have more contextual information available for nonpolitical events than for political events because they learn about the former faster than they learn about the latter.

Experiment 3

In the interpretation of the protocols collected in Experiment 1, it was assumed that an opportunistic retrieval process supported date reconstruction; that is, it was assumed that subjects did not search memory for specific facts but, rather, that they retrieved and evaluated those facts that happened to be most readily available, regardless of their content. This retrieval assumption seems reasonable, given the scarcity of explicit calendar dates in long-term memory and the abundance of other sorts of potentially useful information; however, it might be too strong. It could be that the subjects focused their search and retrieved only pertinent information, or it could be that they retrieved information in an opportunistic manner and then screened each retrieved fact before submitting it to the inference process. The possibility that subjects employed one of these alternative retrieval strategies does not seriously undermine the conclusions concerning the relative availability of presidential and personal facts because both types of facts are inherently temporally informative. This means that contextual and presidential information should have been retrieved and evaluated regardless of whether the subjects limited their search to temporally informative facts or chose to evaluate only those retrieved facts that seemed relevant.

Although plausible modifications to the retrieval process do not affect conclusions concerning personal and presidential information, they do suggest a second interpretation for the finding that subjects retrieved more same-narrative events than nonnarrative events in Experiment 1. This result was taken as evidence that the strongest interevent associations tend to be between events belonging to the same narrative. However, the predominance of same-narrative responses may simply reflect the fact that same-narrative events are more likely to be causally linked than are nonnarrative events. Because causes precede consequences, the knowledge that a causal relation holds between two events at least provides relative temporal information. Thus it would make sense for a subject who focuses on the retrieval and evaluation of

temporally informative facts to consider same-narrative events and to ignore or reject nonnarrative events.

Experiment 3—a free-association study—was designed to provide a replication of this same-narrative advantage in a situation that de-emphasized temporal information. In this experiment, subjects were presented with the descriptions of 36 recent public events and were asked to write down the first public event that came to mind. If public events tend to be embedded in public narratives, and if the association between events embedded in the same narrative tend to be stronger than other sorts of interevent associations, then same-narrative events should be retrieved more often than should other sorts of events.

A second issue addressed in this study was the apparent relation between the political nature of an event and the likelihood that it would be subsumed by a public narrative. In Experiment 1, political events (32%) elicited more same-narrative responses than did nonpolitical events (9%). This suggested that political events are more likely to be embedded in public narratives than nonpolitical events. There is, however, an alternative explanation: This difference may have been a by-product of the differential availability of personal information. According to this view, nonpolitical events are just as likely as political events to be embedded in narrative frameworks, but nonpolitical events are more likely than political events to be associated with retrievable personal information. In this situation, competition from personal facts would be greater for nonpolitical events. Therefore, subjects should retrieve fewer of the available same-narrative events when dating nonpolitical events.

In Experiment 3, as in Experiments 1 and 2, event type was manipulated; half of the event descriptions referred to political events and the other half referred to nonpolitical events. If political events are more likely to be embedded in narrative contexts than nonpolitical events, the former should elicit more same-narrative responses than the latter. However, if nonpolitical events are embedded in narrative structures as frequently as political events, event type should not influence the probability that subjects will respond with same-narrative events.

Unlike the earlier experiments, event knowledge was directly manipulated in this study. This was done in order to demonstrate that the free-association task is sensitive to the availability of same-narrative events. The rationale for using event knowledge came from a pilot study in which subjects were explicitly instructed to write down three same-narrative events for each of 36 public events. This study produced a strong correlation between event knowledge and the frequency of same-narrative responses, suggesting that well-known events are more likely to be embedded in narrative structures than obscure events. Hence if the current task were sensitive to the relative availability of narrative information, same-narrative responses would be more common for the high-knowledge events than for low-knowledge events.

Method

Materials and design. Thirty-six public events were selected for this experiment. Half of these were political events, and half were

nonpolitical events. Within each event type, half of the items referred to high-knowledge events, and half referred to low-knowledge events. The assignment of event to level of knowledge was based on knowledge ratings collected from 20 pilot subjects a week before this experiment was conducted. In selecting items, objective age of event was balanced across the four cells of the design, and prior knowledge was balanced across event type within level of knowledge. On the average, the events had occurred a little more than a year before the time of the experiment (January 1984). (See Table 5.)

Table 5
Event Descriptions in Experiment 3

Date	Event
Political high-knowledge events	
April 1983	Harold Washington becomes mayor of Chicago.
September 1983	Soviets shoot down KAL Flight 007.
October 1983	241 U.S. soldiers die in Beirut truck bombing.
October 1983	U.S. medical students evacuated from Grenada.
October 1983	Secretary of the Interior James Watt resigns.
February 1984	Jesse Jackson's "hymie" remark reported in the press.
July 1984	Geraldine Ferraro nominated for Vice President.
October 1984	Indira Gandhi assassinated.
November 1984	Western nations mount major Ethiopian relief effort.
Political low-knowledge events	
July 1982	Secretary of State Alexander Haig resigns.
October 1982	Helmut Kohl elected West German Chancellor.
July 1983	Polish government lifts martial law.
April 1984	Woman police officer killed outside of Libya's London embassy.
April 1984	President Reagan visits China.
January 1984	Kissinger Panel asks for \$8 billion in aid for Central America.
August 1984	15 ships damaged by Red Sea mines.
September 1984	Shimon Peres becomes Israeli Prime Minister.
October 1984	President Duarte meets with Salvadoran rebel leaders.
Nonpolitical high-knowledge events	
March 1982	John Belushi dies.
October 1982	Seven people die in Tylenol poisonings.
November 1983	"The Day After" aired for first time.
January 1984	AT&T divested of local telephone companies.
April 1984	Marvin Gaye dies.
July 1984	Vanessa Williams loses Miss America title.
July 1984	Los Angeles Olympics begin.
October 1984	Chicago Cubs win the Eastern Division title.
December 1984	Over 2,000 die in Bhopal chemical disaster.
Nonpolitical low-knowledge events	
September 1982	Grace Kelly dies.
September 1983	Australia II wins the America's Cup.
November 1983	Rupert Murdoch buys the Chicago Sun Times.
December 1983	Three judges indicted in "Greyford" scandal.
July 1984	Alton Coleman captured in Evanston.
August 1984	Truman Capote dies.
September 1984	24 arrested in Jordan Minnesota child abuse case.
October 1984	FBI agent Richard Miller arrested for spying.
November 1984	Margie Velma Barfield executed in North Carolina.

Procedure. Each experimental session was divided into two parts: a free-association phase and a knowledge-assessment phase. Half of the subjects performed the free-association task first and the knowledge-assessment task second, and half of the subjects performed these tasks in the opposite order. Although subjects knew that they would be required to perform two tasks, they were not informed of the nature of the second task until they had completed the first. Subjects were tested individually and were randomly assigned to a task order.

During the free-association phase, each subject was presented with a booklet in which the 36 event descriptions were listed in a unique random order, 9 to the page. Under each description was a line for the subject's response. Subjects were instructed to write down the first current event (other than the target event) that came to mind. They were also told that they should not write down a retrieved event if it had already served as a target event, if it already had served as response, or if it was a "historical event" (i.e., if it happened before the subject was born). Moreover, they were instructed not to write down autobiographical events, additional details concerning the target event, or paraphrases of the event description. Finally, subjects were asked to work through the events in the order they appeared and not to return to an item once they had gone on to another.

The knowledge rating forms were identical to the free-association forms, except that the work *knowledge* was printed underneath each target event. During this phase, subjects were instructed to write down the number of facts that they could recall about each event.

Subjects. The 30 subjects who participated in this study were all University of Chicago undergraduate and graduate students recruited through an advertisement in the university paper. None of these subjects had participated in previous current-events experiments, and each was paid \$4 for a session lasting approximately 45 min.

Results

Knowledge ratings. A mean knowledge rating was computed for each event over all subjects. These event means correlated highly (.84, $p < .001$) with the knowledge ratings used to assign events to knowledge level. Because the ratings for all of the high-knowledge events were higher than the ratings for all of the low-knowledge events, it was not necessary to reassign events to knowledge level.

In order to analyze the effect of the experimental factors on the knowledge ratings, two ANOVAs were performed. For the subjects analysis, responses were averaged over items within each of the four cells of the design. For the items analysis, responses were averaged over subjects within a task order. The means were submitted to ANOVAs in which event type, level of knowledge, and task order served as fixed effects, and subjects or items served as random effects. The mean knowledge ratings were 5.45 for high-knowledge political events, 4.97 for high-knowledge nonpolitical events, 2.54 for low-knowledge political events, and 2.42 for low-knowledge nonpolitical events. Subjects rated their knowledge of political events (4.00) slightly higher than their knowledge of nonpolitical events (3.69; $\min F' < 1$), and the "rate-first" subjects (3.90) scored their knowledge slightly greater than did the "associate-first" subjects (3.79; $F_s < 1$ for both subjects and items). However, only level of knowledge proved to be significant. On average, subjects claimed to know more than twice as much about the high-knowledge events (5.21) as about the low-knowledge events (2.48), $\min F'(1, 54) = 36.4$, $p < .001$. Finally, none of the higher order interactions approached

significance when both items and subjects were taken into consideration.

Free-association responses. Each free-association response was assigned to one and only one of the following categories: (a) *same-narrative*, (b) *same-activity*, (c) *both* (same-narrative and same-activity), (d) *thematic*, (e) *idiosyncratic*, and (f) *nonresponse*. A response was considered to refer to a same-narrative event when there was an obvious causal connection between the target event and the response, when the response referred to an event that was a member of the target event's narrative even if there was no obvious causal connection between the two events, or when the response was one of the target event's subevents. For example, narrative responses to the target event "241 marines die in Beirut truck bombing" included references to U.S. airstrikes against the Syrians in the Bekaa Valley (direct causal), the withdrawal of the Marines from Beirut (indirect), and the search through the wreckage for survivors and bodies (subevents).

Responses fell into the same-activity category when they involved the same type of action as the target event. This category was defined broadly so that events of the same general type as the target event were considered to be same-activity responses. For the Beirut truck bombing, events such as the bombing of Harrod's Department Store by the Irish Republican Army (a terrorist bombing) and the murder of four soldiers in San Salvador (a terrorist act that did not involve a bomb) were considered to be same-activity response. An item was considered to be a "both" response when it met the criteria for the same-narrative category and the same-activity category. For example, a "both" response to the truck bombing of the Marine base in Beirut was the truck bombing of the U.S. embassy in Beirut a year later.

A response was considered to be thematically related to a target event when the two events were similar in some obvious way but were not members of the same narrative or examples of the same action category. In general, a thematic response overlapped with the target event because the two events involved the same participant, took place in the same country or geographical region, or shared a common topic. For example, the response "Capote writes *In Cold Blood*" was considered to be thematically related to the target event "Truman Capote dies" because both events concerned Truman Capote. When there was no obvious connection between a response and the target event that elicited it, the response was considered to be idiosyncratic. For example, one subject gave the response "Cuomo defeats Lehrman as New York State governor" to the target event "Seven people die in Tylenol poisonings." Finally, "nonresponses" were coded when subjects failed to write down an event in response to a target event. As a check on the reliability of this coding scheme, a second judge coded 20% of the responses (6 responses chosen at random for each of 36 items). The two judges agreed 94% of the time on the codings.

Three predictions concerning the outcome of this study were made: First, same-narrative responses would be more common than any other type of response; second, political events would elicit more same-narrative responses than nonpolitical events; and third, high-knowledge events would elicit more same-narrative responses than would low-knowledge events. Data relevant to these predictions can be found in

Table 6. The entries in this table represent the proportion of responses that fell into each of the six response categories just described.

Overall, 44% of the responses were same-narrative responses, 28% same-activity, and 18% thematic, whereas "both" responses, idiosyncratic responses, and nonresponses combined accounted for only 11% of data. In order to test the prediction that same-narrative responses would be produced more often than any other type of response, a sign test was performed. In this test, the number of subjects who produced same-narrative responses more often than same-activity responses was compared with the number of subjects who produced more same-activity responses than same-narrative responses. The results of this test indicated that more subjects (19) fit the first pattern than fit the second (8; $p = .054$, two-tailed). Three subjects responded equally often with both types of events.

Because the last two predictions concerned same-narrative responses, it was possible to perform ANOVAS in which the proportion of same-narrative responses served as the dependent measure. In these analyses, event type, level of knowledge, and task order served as independent fixed effects, and subjects and items served as random effects. As predicted, political events (52%) elicited same-narrative responses more often than did nonpolitical events (35%), $\min F'(1, 43) = 5.26$, $p < .05$, and high-knowledge events (52%) elicited same-narrative responses more often than did low-knowledge events (35%), $\min F'(1, 41) = 5.43$, $p < .05$. These two main effects reflect the fact that subjects retrieved far fewer same-narrative events when responding to low-knowledge nonpolitical events (20%) than when responding to low-knowledge political events (50%), high-knowledge political events (54%), or high-knowledge nonpolitical events (50%). This Event Type \times Level of Knowledge interaction was significant for subjects, $F(1, 28) = 24.4$, $p < .01$, and marginally significant for items, $F(1, 32) = 3.7$, $.05 < p < .10$. Finally, task order had no effect on the probability that subjects would retrieve same-narrative events ($F_s < 1$, by subjects and by items), nor did it interact with the other factors.

Discussion

Subjects in this experiment were more likely to respond with same-narrative events than with any other type of event, and they were more likely to provide same-narrative events

in response to political events and high-knowledge nonpolitical events than in response to low-knowledge nonpolitical events. Assuming that the events selected as responses were strongly associated with the target events, these results imply that public events are often stored with other causally related events and that some types of events (low-knowledge nonpolitical events) are less likely than others to be embedded in a narrative framework.

Given the prior expectations concerning event type, knowledge, and narrative availability, the finding that low-knowledge political events elicited almost as many same-narrative responses as did the high-knowledge events came as a surprise. One explanation for this finding is that many of the low-knowledge political items often appear to have been minor episodes embedded in large, complex narratives. Thus when a subject accessed the representation of one of these minor events, a number of major events from the target's narrative may have been present for consideration. For example, the low-knowledge event "Polish government lifts martial law" was clearly part of the Solidarity narrative, which had been going on for a number of years and had involved a number of well-publicized events, including the riots in Gdansk, the formation of the Solidarity movement, Lech Walesa's imprisonment, his release, and his Nobel Prize. Although these events may or may not have been directly (i.e., causally) related to the target event, they were events that subjects were likely to know about and might recall when considering the situation in Poland in a general way. In contrast to low-knowledge political events, low-knowledge nonpolitical events often seem to exist in isolation. For example, one may be well aware that Truman Capote died and still be ignorant of the circumstances surrounding his death. This does not imply that such events do not have causes or consequences; clearly they do. However, it does suggest that the public probably had little opportunity to learn about these events or little interest in doing so.

These observations suggest that the representation of public narratives in memory differ in complexity and that these differences mirror the structure of events in the world, at least to the extent that this structure is captured by the news media. At one end of the complexity continuum are *isolated events*, such as the death of Truman Capote. People may recognize such events and may even know a few facts about them. However, they are considered isolated because the public has little awareness of their causes or consequences. At the op-

Table 6
Proportion of Responses for Each Event Type in Experiment 3

Event type	Response type					
	Same narrative	Same activity	Both	Thematic	Idiosyncratic	Nonresponses
Political						
High	.54	.26	.02	.11	.05	.01
Low	.50	.24	.02	.14	.08	.01
Nonpolitical						
High	.50	.22	.00	.21	.02	.03
Low	.20	.38	.01	.24	.04	.11
M	.44	.28	.01	.18	.05	.04

posite end of the continuum are *multiepisode narratives* such as the U.S. involvement in Lebanon, the Aquino revolution in the Philippines, and the Iran-contra affair. These narratives organize a number of major and minor events that may be causally and hierarchically interrelated in complex ways. Between the two extremes are *focal-event narratives*, which center on a single well-publicized event, such as the Tylenol poisonings or the death of John Belushi. What distinguishes narratives of this sort from isolated events is that people generally have knowledge of some of the minor events that caused or resulted from the narrative's central event. These distinctions can be mapped on to the design of Experiment 3 in the following way. Political events, regardless of level of knowledge, tended to be drawn from multiepisode narratives; high-knowledge political events are distinguished from low-knowledge political events by their importance. In contrast, high-knowledge nonpolitical items seemed to refer to the main event in a particular focal-event narrative, and low-knowledge nonpolitical items tended to refer to isolated events.

This does not imply that political events must be subsumed by multiepisode narratives or that nonpolitical events can never be embedded in such narratives. Such assertions would clearly be too strong. After all, some political events do stand in relative isolation (e.g., Reagan's visit to the Bitburg Cemetery), and some nonpolitical events do initiate chains of memorable follow-up events (e.g., Ivan Boesky's indictment for insider trading). Yet the existence of a relation between event type and narrative complexity seems more than coincidental. In particular, the tendency for people to form multiepisode political narratives can be seen as a natural consequence of the structure of political, military, and diplomatic activities. As mentioned earlier, political events often describe the actions and reactions of prominent human or institutional adversaries. The identities of the adversaries and the nature of their conflicts tend to remain stable over long periods, and the course and resolution of these conflicts often have consequences that directly or indirectly affect a large percentage of the population. Conditions like these spawn a large number of related news stories, which in turn foster the development of multiepisode narrative representations.

General Discussion

To summarize, the primary aim of this research was to identify the structures that organize public events in long-term memory. To this end, an organizational model was proposed, and its implications were investigated in three experiments. Experiment 1 was a protocol study in which subjects thought aloud as they estimated dates for current events. These dating protocols provided data consistent with several aspects of the proposed model. In particular, the results indicated (a) that associations between same-narrative events tend to be stronger than other sorts of interevent associations, (b) that accessible historical periods exist but some public events (political events) are more likely to be related to these periods than others (nonpolitical events), and (c) that people frequently encode facts about public events along with information about the personal context in which those facts are encountered. The results also indicated (d) that nonpolitical

events are more likely to be stored with retrievable personal information than are political events and (e) that political events are more likely to be embedded in narrative contexts than nonpolitical events. Experiment 2 provided converging evidence for (b) and (d), and Experiment 3, for (a) and (e). Some methodological and substantive implications of these findings are discussed below.

From a methodological perspective, this research is important because it demonstrates that verbal protocols can be used to probe the structure of complex real-world domains. It is clear in retrospect that the reports collected in Experiment 1 were a rich and accurate source of structural data; not only did they provide evidence consistent with a proposed organizational model, but they also revealed verifiable distinctions that had not been anticipated. Two assumptions allowed structural inferences to be drawn from the dating protocols. First, it was assumed that an opportunistic retrieval process drove date reconstruction. Second, it was assumed that the organization of information in memory determined, at least in part, which facts would be most readily available and hence which facts would be retrieved and evaluated. Together, these assumptions implied that the content of the protocols would accurately reflect the organization of public events in long-term memory. Although neither assumption was directly tested, results obtained in Experiments 2 and 3 consistently supported the "accurate reflection" interpretations of the protocol data and consistently failed to support interpretations that would have indicated the operation of a more focused retrieval process.

In general, the success of this research program suggests that the verbal protocols will provide useful structural information when the task being performed requires subjects to rely on an opportunistic retrieval process. Because opportunistic retrieval plays a role in many real-world problem-solving situations (Collins, 1978; Collins & Michalski, 1989; Kintsch, 1988; Nickerson, 1980; Norman & Bobrow, 1979; Williams & Hollan, 1981), the protocol technique should be widely applicable. Data provided by date-estimation tasks could certainly lead to a better understanding of the organization of noncontemporary history (N. R. Brown & Siegler, in press) and might help to resolve controversies in the autobiographical memory literature (Barsalou, 1988; Conway & Bekerian, 1987; Reiser et al., 1985). Farther afield, one might use estimation protocols to study how people organize their knowledge of public figures, geography, commercial products, sports, or fine arts. Again, the important point is that this approach can be used to generate an open-ended sample of domain-specific knowledge, and the contents of this sample can be taken as reflection of the domain's underlying organization.

The date-estimation task used in Experiment 1 demonstrated one way in which the organization of information in memory and problem solving are related. In this task, memory structure affected the problem-solving process by determining which of many potentially useful facts would be available for consideration at any given moment. This was important because the cycle of retrieval and inference that allows date reconstruction may halt before all relevant information has been examined. As a result, the availability of information

(which is conditioned by the structure of the relevant facts) may dictate the ultimate solution to a problem, as well as the sequence of inferences that constitute the path to that solution.

Beyond its impact on problem solving, memory structure is important because it affects recall. Research in story comprehension indicates that events with many causal links are better recalled than those with few (Trabasso & van den Broek, 1985), that events on a story's "causal chain" are better remembered than those not on the chain (Black & Bern, 1981; Black & Bower, 1980; Omanson, 1982; Trabasso et al., 1984; Trabasso & van den Broek, 1985), and that well-structured stories (i.e., stories with high proportions of events on the causal chain) are better recalled than poorly structured stories (Trabasso et al., 1984). Given the importance of narrative-like representations in historical memory, it is likely that such structural variables have a powerful impact on how well people remember public events. Thus, other things being equal, a news event with many causes and consequences should be better recalled than one with few; events that are on a public narrative's causal chain should be better recalled than those that are not; and public narratives that have a simple structure should be better recalled than those that have a more convoluted structure. Moreover, to the extent that autobiographical memory is organized in a narrative manner, similar structural factors should affect the memorability of personal events.

One final point concerns the political-nonpolitical distinction that has figured so prominently in this article. This distinction was introduced in order to demonstrate that an event's content, as well as its age, determines whether it belongs to a particular historical period. The research described above indicated that this hypothesis is essentially correct. It also indicated that the political nature of an event is related to the likelihood that it would be stored with readily available contextual information and to the likelihood that it would be embedded in a narrative context. The difference in contextual availability was attributed to differences in the ease of learning, and the difference in the availability of same-narrative responses was attributed to differences in narrative complexity. Although these underlying variables appear to correlate with event type, it is clear that these correlations are not perfect. After all, some political events are readily understood, and some nonpolitical narratives are composed of many memorable events. Thus although the political-nonpolitical distinction has been useful, future research will have to focus on the variables underlying the observed political-nonpolitical differences and the psychological mechanisms that make these variables important.

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