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Nicole Michelle Harsch Date

Flashbulb Memories as Narrative Tales

By

Nicole Michelle Harsch

Doctor of Philosophy

Psychology

_____

Robyn Fivush, Ph.D.

Advisor

_____ _____

Patricia Bauer, Ph.D. Joseph Manns, Ph.D.

Committee Member Committee Member

_____ _____

Stephan Hamann, Ph.D. Scott Lilienfeld, Ph.D.

Committee Member Committee Member

Accepted:

_____

Lisa A. Tedesco, Ph.D.

Dean of the James T. Laney School of Graduate Studies

_____

Date

Flashbulb Memories as Narrative Tales

By

Nicole Michelle Harsch

B.A., University of Michigan, 1986

Advisor: Robyn Fivush, Ph.D.

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Abstract

Flashbulb Memories as Narrative Tales

By Nicole Michelle Harsch

Flashbulb memories (FBMs) were first described by Brown and Kulik (1977) as being photographic-like mental images of hearing the shocking news of an important event. However, many studies have since indicated that FBMs are not more photographically accurate, nor more long-lasting than ordinary autobiographical memories. Instead, what makes FBMs special may simply be that they are often rated as more vivid and are often given higher confidence ratings than ordinary memories. The objective of the present study was to examine FBMs from a new narrative and story-telling perspective, to see if there is something intrinsic about FBMs that distinguishes them as good stories to have and to share, regardless of accuracy. The current study re-examined an established set of FBMs for the space shuttle *Challenger* disaster that were collected from one group of college students over three time periods: in 1986, 1988 and 1989. The current analysis was three-pronged. First, the students' stories of hearing the news were judged using common narrative analysis schemas (coherence, orientation and evaluation) to see if the stories changed over time to become better stories from a structural perspective. Second the narratives were judged from a listener-interest point of view, to see if the narratives became more interesting and worth sharing over time. Finally the students' metamemory comments about why they thought their narratives changed over time were coded to see if, like literary autobiographies, specific details of the FBMs changed over time to become more true to the gist of the experience of the narrator. Results showed that students consistently told coherent narratives that contained a moderate level of orienting details. However, the later 1989 verbal narratives contained fewer evaluative (emotional) comments and were judged by two coders as less interesting stories with less flash and pizzazz. The students' metamemory comments indicated they thought their changed narratives better reflected the gist of their experience and better matched the visual image they held, regardless of accuracy. The limitations of comparing written and verbal narratives over time were discussed.

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It has become the cliché that the majority of Americans who were alive on November 22nd, 1963 can recall with an uncanny clarity where they were and what they were doing when they first learned that President Kennedy had been shot and killed. Brown and Kulik (1977) dubbed this phenomenon "flashbulb memory" (FBM) in order to capture the high vividness and confidence with which people recalled such memories—as if a mental flash photo preserved every noticed detail for future reference. In the three decades following Brown and Kulik's initial inquiry, many newsworthy events have been studied in order to investigate whether these FBMs are actually more special than ordinary memories, and if so, what makes them more special. In this paper, a brief review of the FBM findings so far leads to current research that highlights the phenomenological aspects of the memory and the narrative potential of the event.

This paper begins by describing the findings of traditional FBM research. It delves deeply into Brown and Kulik's original theory, long held-up as a straw man for those researchers who've followed. The original theory is especially well-suited to the role of a straw man due to its unabashedly strong claims that FBMs are more vivid, more accurate and more long-lasting than ordinary memories. In fact, it wouldn't be overstating the case to say that Brown and Kulik's original theory established a path which later FBM researchers have worn deep with their back and forth. For over thirty years, strong claims have been formulated, debated and reformulated. Even the core definition of what it means to be a FBM has been disputed and varies from study to study. And yet, despite strong criticisms and disagreements on a variety of fronts, researchers have not been able to affect the zeitgeist that FBMs are a unique type of memory. One current trend, moving off the beaten path, has been to look for the root of FBM's uniqueness in the social and cultural context of an FBM event. If FBMs are not actually more vivid or accurate than ordinary memories, as many have argued, then perhaps there is a social-sharing reason for people to confidently believe they hold vivid and accurate memories of events deemed as highly newsworthy. Perhaps FBMs function as good stories to have on hand to share and compare with others who also have FBMs of the same event. In that vein, this paper uses

research on the underlying structure of narratives, story-telling and literary autobiography as a foundation on which to re-evaluate and extend research from an earlier study of FBM for the Space Shuttle *Challenger* disaster by Neisser and Harsch (1992).

Specifically, this paper considers three hypotheses, each based on the idea that FBMs may not be photographically static, as the name implies, but may instead flex over time, in ways that make them "better" narratives. Of course, there are many possible definitions of what makes a narrative "better," but this paper limits itself to considering only three. The first hypothesis is that, over time, participants may repackage the stories they tell about their memories using traditional narrative schemas in order to lend coherence, orientation and evaluative details to the telling. The second hypothesis is that uninteresting details in the original memory may be dropped over time to be replaced with more interesting details that make the stories more engaging for a listener. The final hypothesis is that subjects' FBMs may change over time to better fit what the narrator believes to be most true about his or her life at the time of the original event.

A Brief History of Flashbulb Memory

To appreciate current thinking regarding FBM it is helpful to review the strongly formulated original theory and its various incarnations. Initially, Brown and Kulik (1977) examined personal memories of highly newsworthy events—such as the deaths of several well-known political leaders—and concluded that the recalls were so extraordinarily detailed and vivid, the phenomena could best be explained using a flash-camera metaphor. [See Colegrove (1899) for a similar account of memories for President Lincoln's assassination that pre-dates the commercial production of flashbulbs by approximately 30 years.] According to Brown and Kulik's flashbulb metaphor, brains come pre-wired with a quasi-photographic recorder—a biological "special brain mechanism" patterned after Livingston's (1967) *Now Print!* theory—that preserves a mental snapshot of those rare events that are novel, shocking and

consequential. As discussed below, Brown and Kulik also considered what type of information is recorded during FBMs and what type of event triggers the mechanism.

Defining Flashbulb Memory. The definition of FBM is not always agreed upon and varies a bit from study to study. The prototypical flashbulb event involves a highly newsworthy public incident (Hirst & Meksin, 2009) and much of the literature has focused on reception events (Larsen, 1992) where individuals are shocked to hear secondhand news of some national or international happening. Most of the FBMs in the psychological literature have been categorized as public shocks, where "many people have experienced the same target event at a known time" (Pillemer, 1992). However, Brown and Kulik also included in the FBM category "sundry private shocks" (p. 80), though these have been much less commonly researched (Pillemer, 2009). Brown and Kulik, gave as an example of a private shock, the event of receiving unexpected news of the death of a parent or a friend (p. 75). Interestingly, all of Brown and Kulik's examples of public and private shocks involved hearing emotional news secondhand—which is not always the case in the research that followed. Also, all of Brown and Kulik's FBMs, both public and private, could be elicited by the question "Where were you when you heard the news?" The original theory stated that upon hearing shocking news, certain brain processes triggered a mental camera shutter that clicked open to capture the event. However, as mentioned above, later researchers expanded the public shock category beyond reception events to include those newsworthy events (like an earthquake or hurricane) where an individual was actually a participant in or eyewitness to the event itself (Er, 2003; Fivush, Sales, Goldberg, Bahrick, & Parker, 2004; Neisser et al., 1996). In such firsthand situations, the specific trigger for the mental camera shutter varied from event to event and was less well-defined than the act of "hearing the news" because the participant was actually part of the news. And at its most inclusive, the definition of FBM has been stretched to incorporate ANY memory for which an individual reported having a mental snapshot—such as a consumer's first experience with Krispy Kreme donuts (Roehm & Roehm,

2007) or a patient's most surprising session with a psychotherapist (Thomsen & Berntsen, 2003). The broadest definition of FBM seems to be: if an individual believes he or she has a strong visual memory and can later reference a vivid mental snapshot, then there must have been an earlier mental flash; hence, the memory can be labeled a FBM.

The Photographic Copy Theory. Brown and Kulik described their mental snapshots as being "very like a photograph that indiscriminately preserves the scene in which each of us found himself when the flashbulb was fired" (p. 74). Much like a paper photo, FBMs were considered by Brown and Kulik to be "fixed for a very long time, and conceivably permanently" (p. 85). And even better than a photo, the mental FB image was said to possess a special "*live* quality that is almost perceptual" (p. 74). The implication was that those who reminisced about a FBM event experienced a higher proportion of extremely vivid visual memories during their recalls (Brewer, 1992). However, unlike an actual photo that records every detail in the camera's field of view, the FBM mechanism was said to capture only those details to which the subject had attended. The attended-to memories might include details of the precipitating historical event and, more importantly, of the circumstances in which one personally learned of the event.

As Brewer (1992) explained in his thorough critique: Brown and Kulik, in referencing Livingston (1967) were essentially proposing a very strong "copy theory" for FBMs. The camera metaphor for the special brain mechanism implied that the mental photograph, the FBM, was a direct one-to-one copy of many aspects of the actual situation, including the visuals, the thoughts and the feelings. Some have postulated that the special mechanism that makes the copy is simply an offshoot of the already existing neuroendocrine processes regulating human memory storage (Gold, 1992). In that vein, Conway (1995) described Livingston's special brain mechanism as a five-step copy process that starts with two gate-keeper brain functions: 1) reticular recognition of novelty, and 2) limbic discrimination of biological meaning. Conway further explained that most everyday events would not pass the limbic test of consequentiality (in step 2 above) and thus

would be quickly forgotten, never becoming a FBM. However, for those highly surprising events also judged as highly consequential, three additional brain processes would include: 3) limbic discharge into the reticular formation, 4) a reticular discharge into both hemispheres to issue a "Now Print!" order for memory, resulting in 5) all brain events, (including those concerned with the event and with the self), being precisely copied to memory (Conway, 1995). The theory was very front-loaded and assumed that the consequentiality and significance of an event could be ascertained within seconds, triggering the metaphorical brain camera shutter on the spot, without the need for hours or days of later pondering or reflection.

Another indication of how front-loaded the original theory is appeared when Brown and Kulik speculated on what happened to an FBM after it was encoded—as the memory was covertly and overtly rehearsed for hours or days. They proposed that each time the memory was talked about or thought about, the association between the mental photo and the narrative was simply strengthened, making the already vivid and permanent FBM more easily accessible. They spoke of later rehearsal as an amplification process that didn't change the perfect nature of the memory itself, but rather made the memory easier to access. In fact, they used the term "constructive" (p. 86), instead of reconstructive. Specifically, they said that different narratives were constructed to respond to different cues—by which I understand them to mean cues as different as the prototypical research question "How did you learn that Kennedy had been shot?" or the more conversational "Do you remember any of your childhood teachers?" In the latter case, a person might, for example, draw upon his FBM of hearing the news of the Kennedy assassination when constructing a narrative about the teacher who once cried in class. For Brown and Kulik, the teacher-crying story would be a constructed narrative that "draws its content from the unchanging flashbulb memory" (p. 86). Presumably there could be a large number of stories that all draw content from the same FBM. Interestingly, the word reconstructed did not appear anywhere in the Brown and Kulik paper. For them, rehearsal did not alter the mental snapshot itself; rehearsal only strengthened the original memory, or added narrative connections to it.

For Brown, Kulik and many others, a primary fascination with FBM centered on the last step of the special mechanism: the moment where all brain events are precisely copied to memory. Specifically, they pointed to the seeming mismatch between the often global-importance of a precipitating news event and the relatively unimportant wealth of personal minutia captured by a person's memory when the flash fires. For example, participants in Brown and Kulik's study reported, 12 years after President Kennedy's death, a wealth of trivial personal details—what they themselves were doing, who was with them, what they thought, and what they felt when they first heard the news. Indeed, FBM accounts always contain a number of trifling personal details of the type that are usually rapidly and completely forgotten in other situations (Conway, 1995). Brown and Kulik offer an example of a man who recalled he was holding a carton of Viceroy cigarettes when he heard the news that Kennedy had been shot (p. 80). They question the usefulness of remembering, presumably forever, mundane details such as the specific brand of cigarettes one is holding—a trivial personal detail compared with the nationally salient emotional trigger of the assassination of a president. Brown and Kulik, conclude that the personal minutia is "utterly idiosyncratic and, in a sense, accidental content" (p. 95) and add "there is no obvious utility in such memories" (p. 74). After all, most publicly shared FBMs involve, at best, a third-hand connection to a historical event. To compare it with the field of eyewitness testimony, (where witnesses are often connected first-hand to the event and give focused testimony about the event itself), the prototypical FBM study participant's memories are usually so physically disconnected from the event (e.g. they might have heard the news from a friend who heard it from an anchorman who heard it from a reporter on the scene) that, as testimony, their accounts could be labeled immaterial. For Brown and Kulik, the preserved personal details seem as inadvertently recorded as when one's own thumb gets caught at the edge of an actual photo of a more important scene. The fact that FBMs capture personal details not essential to the news story is explained as a biological accident, a byproduct of a larger emotional

memory system that evolved to help our ancestors quickly capture "crucial information for the well-being of the whole community" (Curci & Luminet, 2009).

The event that triggers the flash. A central question is whether every highly emotional event is equally capable of producing FBMs. For Brown and Kulik, the simple answer is no. For Brown and Kulik, the precipitating event has to be both novel and surprising in order to set off the flash to make the mental copy. Novelty is required as a minimum threshold. Otherwise, if the event is common and ordinary, it will not be attended to enough to lead to an emotional reaction of surprise. Novelty and surprise together trigger the evaluation of an event for consequentiality. And, to Brown and Kulik, only if the event is judged as consequential will a mental snapshot be taken by the brain's camera and stored for future reference. So for Brown and Kulik a FBM event has to be, by definition, novel, surprising and consequential. And for Brown and Kulik, the perception of novelty, surprise and consequentiality all follow within a few seconds of hearing the news of the event.

Predictably, in the studies that follow Brown and Kulik there is not always agreement about which highly newsworthy events count as novel, surprising and consequential *enough* to produce lasting FBMs (cf. the critique of studies of the foiled assassination attempt of President Reagan (Wang & Aydin, 2009)). The large variation across FBM studies can be quickly understood by reviewing the wide variety of target events, which include: the attempted assassination of Ronald Reagan in 1981, (Pillemer, 1984); the Hillsborough soccer riot (Wright, 1993; Wright, Gaskell, & O'Muircheartaigh, 1998); the confirmation of Clarence Thomas as Supreme Court Justice (Morse, Woodward, & Zeigenhaft, 1993); the resignation of Prime Minister Thatcher in 1990 (Cohen, Conway, & Maylor, 1994; Conway et al., 1994); the bombing of Iraq that marked the beginning of the First Gulf War (Weaver, 1993); a California earthquake (Neisser et al., 1996); Ross Perot's withdrawal from presidential candidacy (Levine, 1997); the death of the King of Belgium (Finkenauer et al., 1998); a severe earthquake in Turkey (Er, 2003),

reports of the O.J. Simpson verdict (Schmolck, Buffalo, & Squire, 2000; Winningham, Hyman, & Dinnel, 2000) and the 9/11 attacks on the World Trade Center (Curci & Luminet, 2006; Talarico & Rubin, 2003)…among others.

In practice, identifying a news event's FBM-worthiness is sometimes a matter of narrowly defining the members of the group experiencing the event. For example, when viewed at a national level, a scientifically predicted hurricane in South Carolina can be labeled as a common yearly or bi-yearly event (in the grand scheme of things) that does not rise to the level of a national FBM event by the original definition. Thus, from a larger national perspective, a hurricane forewarned by the National Weather Service in a small community prone to yearly hurricanes might not be judged as surprising or novel or nationally consequential. However, within a more narrowly defined group (e.g. people with houses in the path of that hurricane), an argument can be made that a local hurricane event produces local FBMs for the affected group. Likewise, the definition of novelty often flexes and can include, for example, the first hurricane ever experienced by a small community—even though that community may be located in a state where yearly hurricanes are common and expected. Similarly, the definition of surprise often flexes to include, for example, hurricanes predicted for days in advance that nonetheless produce a surprising amount of damage. If a subject believes he has a vivid visual memory of an event, a mental snapshot, then some researchers consider it's an FBM, regardless of whether the event is common or long expected (cf. Neisser's 1982 discussion of his FBM of the long anticipated resignation of President Nixon).

Traditional lines of inquiry. Although the original theory proposes that FBMs are mental copies of the precipitating event that remain relatively unchanged over time, critics have shown that the Brown and Kulik's data are not appropriate for testing their own copy theory (Brewer, 1992; Neisser, 1982; McCloskey, Wible, & Cohen, 1988; Wright, 2009). Brown and Kulik gathered their first data thirteen years after the Kennedy event by asking participants

whether they remembered the assassination and crediting them with an FBM if they answered yes while providing at least one attribute of the reception context. Although their participants confidently reported FBMs that were detailed and vivid thirteen years later (and it is clear that Brown and Kulik believed these memories to be veridical copies), there is no initial data with which to compare later recalls. In order to validate the recall as accurate, to make sure a thirteen-year-old vivid memory is a genuine copy and not simply an error-filled reconstruction, Neisser (1982) proposed a test-retest methodology where an initial memory report is taken as soon after the event as possible, to serve as index against which to compare follow-up reports. Interestingly, other early FBM studies, also of the Kennedy assassination, (Winograd & Killinger, 1983; Yarmey & Bull, 1978) also offered no data to discern whether the FBMs reported are indeed photo-perfect copies of the subject's experience.

Eventually, studies of other news events—(such as the space shuttle *Challenger* disaster, Swedish Prime Minister Olof Palme's assassination, and a California earthquake)—indicated that memories, when tested for accuracy against earlier accounts, contained many more errors than a strong special mechanism theory predicted (Christianson, 1989; Harsch & Neisser, 1989; Neisser & Harsch, 1992; Neisser et al., 1996). This evidence from the test-retest paradigm was persuasive and eventually led to a revised special mechanism hypothesis (also known as the "weak special mechanism hypothesis"). The revised hypothesis concedes that FBMs are not as "unchanging as the slumbering Rhinegold" (Brown & Kulik, 1977), but maintains that FBMs are still much stronger than normal memories and thus require a special memory mechanism to explain them (Cohen, McCloskey, & Wible, 1988; Cohen, McCloskey, & Wible, 1990; Conway et al., 1994; McCloskey, Wible, & Cohen, 1988; Pillemer, 1990; Schmidt & Bohannon, 1988).

In fact, research on FBM has been largely dominated by this debate over whether FBMs are vastly different from ordinary memories and whether they require a special camera metaphor to explain them (Neisser, 2003). One reason for the years of inconclusiveness has to do with the lack of standardization across studies on three points: 1) the selection of vastly different FBM-

worthy events, with different levels of novelty and surprise 2) the use of widely different experimental designs and 3) the use of different coding schemes for evaluating the quality of the memory (Julian, Bohannon, & Aue, 2009; Pillemer 2009; Wright, 2009). And yet, in spite of the wide variation in event selection and study design, most FBM researchers investigate the same narrow set of emotional, cognitive and social factors connected to FBM (Conway, 1995; Finkenauer et al, 1988), although they often disagree about how much emphasis to place on one factor or the other (Luminet, 2009).

A Current View of FBM

Recently, Talarico and Rubin (2009) reviewed the FBM literature, specifically focusing on the commonly researched emotional, cognitive and social factors affecting FBM. In particular, they considered four internal properties of FBMs: accuracy, consistency, longevity and vividness. They also investigated whether FBMs differed from ordinary memories on these points. [For the sake of contrast, they defined ordinary memory as any autobiographical recollection that might come to mind easily after a question about a particular time or event, or in response to a word cue (p. 80).] They found no significant difference across the first three variables. On the other hand, FBMs were found to be more vivid than ordinary memory as a whole, but only as vivid as the most vivid ordinary memories—leading them to conclude that the same brain mechanism could be responsible for both. Talarico and Rubin also compared participants' reports of their experiences of the precipitating event and concluded that studies do not consistently show FBMs to be more surprising, more consequential, or more emotionally stimulating than ordinary emotional memory events. Their final conclusion was that FBMs are rated higher on self-report scales of vividness and confidence, but are no different than ordinary memories with regard to accuracy, consistency or longevity. They also found that two commonly studied factors, surprise and emotional intensity, are poor predictors for formation and consistency of FBMs. They suggested that instead of considering the significance

(consequentiality) or distinctiveness (novelty) of the event as an indirect factor of FBM formation, future researchers should consider these two factors as the predominant mechanism responsible for FBM. (p. 91).

Talarico and Rubin (2007, p. 557) concluded that "FBMs *are* special, just not in the way that we have traditionally defined them." Extraordinary confidence and vividness differentiate FBMs, not extraordinary accuracy or emotionality. People deeply believe they carry accurate mental snapshots of FBM events, whether or not their memories are accurate.

Support from the Challenger Study

The Talarico and Rubin view of FBM aligns perfectly with the data from the Neisser and Harsch (1992) study of the space shuttle *Challenger* disaster. If significance and distinctiveness of an event are indeed the main criteria for FBM formation (Talarico & Rubin, 2009), the *Challenger* disaster certainly qualifies. In fact, before the September 11th, 2001 terrorist attacks, the *Challenger* disaster was arguably the pre-eminent, FBM-producing event for Americans born after the Kennedy presidency. Before the *Challenger* exploded on January 28, 1986, there had been a total of 24 successful space shuttle flights over the course of five years, the *Challenger* itself had completed nine previous flights, and time between shuttle flights had been honed to one flight every three months (Presidential Commission, 1986), leading to a national sense of complacency with the concept of spaceflight. In fact, space travel had developed such a strong reputation for safety that a high school teacher from New Hampshire named Christa McAuliffe was onboard as the very first civilian passenger into space. The mission was highly publicized and school children across the country watched live TV coverage in their classrooms through a NASA feed (Wright, Kunkel, Pinon, & Huston, 1989). Then, at exactly 73 seconds after lift-off, the shuttle's external fuel tanks ruptured, resulting in a massive fuel burn, fireball and vapor cloud (Presidential Commission, 1986). Within seconds, several diverging white smoke trails streaked through the clear blue sky as the shuttle broke into pieces that fell to earth. Initial

speculation was that one piece might be an intact crew compartment containing the seven living astronauts, but within a short time it became clear there could be no survivors. Although CNN was the only network to cover the launch live, other TV stations soon pre-empted regular programming with news coverage and instant replays. That night a visibly moved U.S. President Reagan postponed his pre-scheduled State of the Union address to speak to the nation about the tragedy in a speech covered by all the major networks. President Reagan also spoke at the memorial service three days later. NASA suspended all manned flights for 2.5 years as they investigated the accident and redesigned the O-ring system on the external fuel tank, which was found to have caused the accident. Though it may not seem so now, especially in light of the 2003 space shuttle *Columbia* disaster, at the time, the space shuttle *Challenger* disaster was a nationally significant and very distinctive event.

Also in line with the Talarico and Rubin conclusions about FBM, self-reported ratings of vividness and confidence were very high in the Neisser and Harsch (1992) *Challenger* study participants, but did not correlate with accuracy scores or ratings of emotionality (as explained in more detail below). Indeed, since the focus of the present study involves narrative reevaluation of the Neisser and Harsch *Challenger* study memories, a brief review of the original findings will prove helpful in understanding the present study and so follows immediately below.

In the Neisser and Harsch study, undergraduates at Emory University recorded details of how they heard the news of the *Challenger* disaster within 24 hours of the event (T1). About two and a half years later (T2), 44 students were called back for a follow-up questionnaire and at that time only 11 of them remembered having filled out the initial questionnaire as part of their psychology class. (See also Appendices A, B and C for examples of the original written questionnaires and the type of student response they elicited.) Since the main thrust of that study was accuracy, a 7–point scoring system (called the Weighted Attributes Scale–WAS) was developed to compare memories over time. When the students' 2.5-year memories were compared with their initial day-after reports, there was only one student whose memory was

exactly the same over time on every detail (scoring 7 out of 7). Two additional students achieved a perfect score (scoring 7 out of 7) by accurately recalling all the major details, and only making a very insignificant change over time such as what time of day it was and/or what they had planned to do before getting caught up in the event. An additional four students were mostly correct (scoring 6 out of 7), but remembered one important detail differently over time. At the other end of the scale, 15 out of 44 students gave very inaccurate accounts (scoring 0 or 1 out of 7) when asked to recall where they were when they'd heard the news. Particulars of the WAS scoring system can be found in the methods section of this paper, but generally speaking, the WAS set a lenient bar for accuracy. For example, a student was given full credit (two points) for remembering exact details about place, informant and activity (with a bonus point for getting the less-important categories—time of day and others present—correct). However, a student was also given partial credit (one point) for answers that seemed close but not quite right (for example, knowing the news came from a friend, but thinking it was a different friend) even though, for example, misremembering exactly who told you important news might be considered a striking memory error. And yet, even given the lenient criteria, the majority of the students' memories were much less accurate than a copy theory of memory would predict.

In an effort to discover whether the participants' missing original memories could be recovered, Neisser and Harsch brought back 40 students at the 3-year mark (T3) for an oral interview (see Appendix D). Memories at the 3-year mark had become a little less accurate—the mean accuracy score slipped from 2.95 to 2.75—and yet the 3-year memories were mostly consistent with accounts given at the 2.5-year mark. Surprisingly, the mean confidence score for all 40 students was quite high at 5.28 out of 7. Students who gave the most consistent accounts (when comparing the 2.5 and 3 years interviews) were also the most confident about their memories ($r = .565$, $p < .001$) regardless of whether the consistent memories accurately matched up with their day-after accounts. In fact, confidence did not correlate significantly with accuracy ($r = .29$, $p < .07$). Participants were also given a number of cognitive tasks used in eyewitness

testimony (cf. Geiselman, Fisher, MacKinnon, & Holland, 1985) in order to jog their memories back to their original accounts whenever applicable. Eventually students were even shown their own day-after hand-written accounts of the event in an effort to help re-sync their current memories of the event with their original memories.

Perhaps the most interesting finding of the Neisser and Harsch study is that "no one who had given an incorrect account in the interview even pretended they later recalled what was stated in their original record" (p. 21). The original memories had vanished to the point that even seeing their own hand-written, day-after accounts did not bring the lost memories back to mind. None of the students ever said, "Oh yeah, that's right" or "I remember that now." In fact, the transcripts indicate that participants commonly expressed surprise such as "Whoa! That's totally different from how I remember it" or "Oh my God, I don't remember this at all!" A student who had first heard the news on the radio said, "God, I don't remember having a radio!" Another student, after reading her own handwritten, day-after account of first hearing the news at a Travel Agency said, "I don't even now have a recollection of being at the Travel Agency." One student explained he was very surprised by his handwritten, day-after account "because it goes against all I have, you know, pictured and all of the, uh, images that I have in my mind right now." When asked if she could picture the events in the day-after account, still another student responded, "No I really can't. I mean, I can…well, I can put all…if I get all the answers and read 'em, I can picture from that, perhaps, but I can't really think 'Yeah now that you mention it, I remember that time.'" Yet another student read her original hand-written account and commented: "But, it still doesn't bring anything back…at all. I mean I can kind of…now that I read it…you can go, well, maybe that did happen, but it didn't…it doesn't seem any more real."

So what happened to those original day-after memories of how they first heard the news? Neisser and Harsch proposed that participants may have, over the course of 2.5 years, simply pushed aside their less visually vivid memories (such as those involving radios and travel agents) and remembered instead the striking images from the TV screen showing the white smoke clouds

following the explosive fuel combustion that broke up the shuttle. In fact, while only 21% of the students reported the day after that they'd learned about the *Challenger* from TV, 2.5 years later 45% of the students reported having a memory that centered on a TV. The suggestion was that participants' 2.5-year accounts are true memories of some real time when they heard news of the *Challenger*, but not the FIRST time as recorded in their own handwriting on the day after the event. This retrieval error theory is based on Brewer's (1988) explanation that a person can, in response to a query, retrieve a true memory from a different or wrong time slice. Neisser and Harsch also proposed that FBMs are more vulnerable to such "mislocations" because reception events "are not constrained by any necessary script or sequence" (p. 30) making them harder to lock into coherent narratives. In hindsight, this conclusion, which was influenced in part on the students' high confidence in their own visual snapshots, may seem a little short-sighted in a society where TV news is a dominant source of information and an argument could be made that undergraduates may share an "I usually hear important news from the TV" script.

One interesting but less-highlighted aspect of the Neisser and Harsch data from the third interview is that students often preferred their current version of the memory to their original hand-written, day-after account. Not only were the original memories apparently gone for good, but also there often seemed to be no love lost for their passing. For example, one student consistently remembered hearing the news from his dorm-mate while stepping out of the shower although his mental picture of which particular dorm-mate had informed him changed over time. While this was scored as a very small change on the WAS scale, the student, when interviewed later, viewed it as a major change because it contradicted his mental snapshot of a totally different human being. He said that he preferred his later version because it made sense because his later-remembered informant was someone he interacted with often—as opposed to the originally stated informant with whom he "really didn't have much contact." Similarly, one student who had a roommate who'd moved in with a girlfriend during the second semester found it hard to believe that he'd heard of the *Challenger* disaster from that roommate, even after seeing it in his own

handwriting, because that roommate "wasn't there 90% of the time second semester." That student's day-after account did not fit with his general knowledge of what most likely would have happened 90% of the time. Another study participant so preferred his current memory of hearing the news that he suggested the many discrepancies between his current and day-after accounts might be attributed to his having filled out the day-after questionnaire in a rush. In other words, he preferred to believe that his discrepancies were not memory errors, but rather transcription errors, made as he hastily wrote of the event on the day after it happened. Interestingly, most of the *Challenger* study participants whose memories changed seemed to prefer their current (T3) narrative to their hand-written, day-after (T1) memory. Shedding light on why that is may require what the autobiographical memory literature calls "a functional approach."

The Functional Perspective

The functional approach to memory does not focus on how accurately details are remembered, but rather on how and why people utilize the imperfect memories they have (Bluck et al., 2005). Bartlett (1932/1955) was an early advocate of a functionalist view of general memory (p. 215) and suggested that "literal recall is extraordinarily unimportant" in the constantly changing world (p. 204). In general, the autobiographical memory literature contains very few systematic evaluations of the functions of memory (Bluck et al., 2005). Thus, it is not surprising that the specific body of FBM literature has focused mainly on one function--the function of veridical recall of earlier events, where questions of accuracy predominate. Although there have long been calls for a widened focus into other functions (Pillemer, 1992; Wright & Gaskell, 1992), and researchers have theorized in their concluding remarks about the purpose served by having a memory of highly newsworthy events (Bohn & Berntsen, 2007; Neisser et al., 1996), most FBM studies give scant consideration to the possible function of confidently remembered but inaccurate FBMs. As Wright (2009) points out, most FBM studies "fail to address the more interesting questions because the way the initial FBM research (Brown & Kulik,

1977) was carried out prompted many subsequent researchers to design studies that are not appropriate to answer many of the interesting questions" (p. 33). Pillemer (1992) also advocated for FBM studies that focus on "the usefulness or adaptive significance" of having a FBM, regardless of accuracy.

In general, everyday autobiographical memories serve three basic functions: a self-function, a social communicative function and a directive/planning function (Bluck, 2003; Bluck et al., 2005; Pillimer, 1992). However, Hyman and Faries (1992) found almost no use for the directive planning function in their study of autobiographical memory. And in his discussion of FBMs of historical events, Neisser (1982) omitted the directive/planning function and focused only on the last two categories such that FBMs: 1) serve as benchmarks that connect a person's life path to the historical timeline (a self function), and 2) allow people to share and compare their stories (a social function). Neisser discussed the role FBMs might play when telling the story of one's life and suggested FBMs, as benchmarks, might be well suited to serve traditional story-telling roles, such as chapter headings or turning points in the plot. Also in the story-telling vein, Neisser stressed a communicative function since people with FBM narratives are aware that others around them have similar FBM narratives that can be shared socially in a joint search for meaning (p. 48). Pillemer (2009) agreed with Neisser's assessment and postulated that the more distinctive and significant FBM events were more likely to serve as benchmarks (a self function) and/or as topics of conversation (a social function).

In fact, studies indicate that one of the most frequent reasons people talk about or think about past events may be for social bonding functions (Hyman & Faries, 1992; Walker et al., 2003). Wang and Ayden (2009) call this the post-social-sharing possibilities of FBM. In Western cultures, sharing stories about emotional experiences is common and is considered to have a cathartic effect (Fivush, 1994; Pasupathi, 2001; Pillemer, 1998). It also serves to strengthen the bond among group members doing the sharing. And in modern times, the media, and especially TV coverage, can serve as a surrogate social sharing network during FBM events.

By watching interviews on TV and other media, it is possible to learn the intimate FBM stories of strangers and to connect vicariously with group members not personally known.

FBMs as Narratives

Taking the functional perspective, the hypotheses examined in this paper all concern whether the *Challenger* narratives change over time to function as better, more share-worthy narratives. Thus, the following sections will provide background for judging the goodness of FBMs as narratives, paying special attention to the concepts of narrative templates, narrative pizzazz, and narrative truth. In addition, possible cultural influences are discussed.

Narrative structure. In theory, the task of re-telling a story seems to be simply an exercise in rote memory, a regurgitation of the material as presented. In practice, people's general knowledge aids in their comprehension and reproduction of stories, such that stories often change and flex in certain predictable ways when retold. Bartlett (1932/1995) in his book *Remembering*, concluded that human memory is basically a "constructive process" (p. 312) where a person's own knowledge is used to close gaps in a story or smooth out the meaning. In his famous study, Bartlett examined memories for a Native American folk tale, "The War of the Ghosts" over several time delays and concluded that adults' retellings did not accurately reproduce the story but rather made reasonable reconstructions. When recalling this unique Native American ghost story, Bartlett found that adults omitted details, simplified the plot, lost the original style and wording, recalled the general form or outline, changed the story to fit their own cultural norms and added new material to aid in rationalization. Bartlett noted that "schemata" used as templates, often without conscious intention, made a story-teller's job of remembering "the easiest, or the least disagreeable, or the quickest and least obstructed that is at the time possible" (p. 44). Such templates were said to come from many sources, including a person's general knowledge of the prose genre, knowledge of how events usually play out in the

real world, knowledge of the author's intent, knowledge of specific personal incidents, or even knowledge of cultural expectations.

Bartlett also noted that the first thing his storytellers included in their recalls was information about their own attitudes and impressions (p. 208). Bartlett found that "…when a subject is being asked to remember, very often the first thing that emerges is something of the nature of attitude. The recall is then a construction, made largely on the basis of this attitude and its general effect is that of a justification of the attitude" (pp. 206–207)." In the recalled story or memory, the particular details of the original are intertwined with personal evaluations. Bartlett further concluded that, when recalling a story such as "The War of the Ghosts," emotional judgments provided the ground without which the story could not be remembered. Bartlett believed that memories are "imaginative reconstructions, built on the foundation of past and current attitudes which spring from a little outstanding detail which commonly appears in image or in language form" (p. 213).

These narrative templates may also be represented at highly abstract levels. For example, Wertsch (2001) described studies of Russian folk tales conducted by Vladimir Propp in 1968, which suggest that a narrative templates need not be limited to concrete events and characters as they fit into a typical order. Instead, Propp stressed the importance of an overarching purpose, the goal of moving the story along, and concluded that different functions may be filled by totally different character types or totally different events, across many folk tales that may seem disparate at first glance. Wertsch explains that this "switches the focus from analyzing a list of specific narratives to analyzing an underlying pattern that is instantiated in many of them" (p. 1). Wertsch differentiates between what he calls "specific narratives" (a set of specific events grasped together into a concrete account) and "specific narrative templates," which operate at a higher level of abstraction and organize knowledge into nebulous wholes with very few specific events. So while several specific narratives may have their own particular setting, cast of

characters, events, and so forth, one overarching narrative template may group them all broadly together.

One over-arching narrative template proposed by Bruner (2006) concerns an ancient Greek story concept that Aristotle called *peripeteia,* which translates as "adventure" in ancient Greek and refers to "a sudden reversal in fortune" in the plot. Bruner says it is the main crux in stories throughout history: to have the main character's life proceed along some culturally accepted "normal path" until there is a breech in the expected state of things—*peripeteia*. The rest of the story then "concerns efforts to cope with or come to terms with the breech and its consequence" (Bruner, 2003, p. 17). According to Bruner, the entire format for successful stories includes an initial canonical state, then *peripeteia*, then action, then resolution and finally a coda (the moral of the story). Interestingly, many FBMs seem to follow at least part of this template in that hearing of an FBM-worthy event causes a sort of mini-breech the daily activities, *peripeteia*, after which normal schedules may change in order to seek out news and deal with the emotional disruption. In contrast, an FBM that does not fit this template, (for example, a story about a person who hears the news and then goes about daily chores without disruption), may result in a story that has less social sharing value—because the story would not include a breech, a twist that would make it interesting from a story-telling perspective.

Narrative pizzazz. Some researchers have emphasized the entertainment value of narratives (Brewer & Lichtenstein, 1982), pointing out that stories that include surprising or suspenseful details are generally considered more interesting when shared. Thus, two stories may exhibit similar story grammars, but differ in particular details that create different affective responses when shared with a listener/reader (Shen, Y., 2002). Cortazzi (1993) cautions that, although such interesting, affective-producing details are important, they are more open to relative interpretation because what adds pizzazz to a story for one person, may not pique an interest in someone else. Pizzazz is a word coined in the 1930s as a synonym for style or flair

that invokes the quality of being exciting or attractive (Merriam-Webster, 2006) and will be used here to refer to narratives that contain interesting details.

In the entertainment industry, professional story-tellers often talk about adding pizzazz or finding ways to "jazz up" their stories in order to add audience appeal, without changing the gist of the tale. Chris King (2003), author of books on professional storytelling and a member of the National Storytelling Network, advises that stories need to include details that make them stand out, in order to avoid boring the listener—especially if the tale being told is a familiar one. In a similar vein, Hollywood screenwriter Jon Deer (2005) cautions that no matter how technically excellent the writing and plotting of a script is, if it doesn't stand out from the pack in some way, if it doesn't have pizzazz, it will fail to catch a studio's attention. Although esoteric from the standpoint of psychological research, the concept of pizzazz seems to play an important role in other descriptions of makes a good tale. Perhaps, FBM narratives change over time in ways similar to those of professional story-tellers or script-writers, that make them more interesting to others and thus more share-worthy.

Narrative truth. There is anecdotal evidence from many of the participants in the Neisser and Harsch (1992) *Challenger* study that their memories of how they heard the news, even when proven inaccurate, nonetheless contained something authentic—some element of truth that was preferred over the day-after, more technically accurate account of what happened. A similar sense comes from John Dean's testimony, which was confidently given and elaborately detailed, during the Watergate scandal. However, when Dean's testimony was compared with the tape recordings from the White House Oval Office, it turned out that Dean had misremembered many specific details and event sequences, even though he characterized the intentions of the main characters truthfully (Neisser, 1981). Barclay (1986) explains such memories as being "true in the sense of maintaining the integrity and gist of past life events" (p 82). In short, these memories may have a kind of "truthiness" to them, which is Merriam-Webster's Word of the

Year 2006 and is defined as "truth that comes from the gut…" or "the quality of preferring concepts or facts one wishes to be true, rather than concepts or facts known to be true" (Merriam-Webster's, 2006). Stephen Colbert, an American TV show host who coined the term truthiness in 2005, defines it in an interview as: "What *feels* like the right answer…" (Schorn, 2006).

Barclay (1986) reported a similar quality of truthiness in literary autobiography where the essential ingredient is "that the meaning of the author's life is portrayed honestly" (p. 84). The autobiographical author, perhaps like the student sharing an FBM memory, is free to choose descriptive details, in order to provide a realistic impression of real events. Barclay says there is no need for the specific details to be accurate in and of themselves so long as the overall picture is truthful; though he also cautions that there is a line past which an autobiography will cross from truthiness into fiction (p. 85).

Many who study autobiographical memory have concluded that narratives have a truthiness quality because the function of recall often is to create overall meaning and significance, with less concern toward accurately preserving the facts themselves (Bruner, 1996; Bruner and Feldman 1996; Ross & Newby-Clark 1998; Spence, 1982). Meacham (1995) developed a clever visual representation that conceptualizes remembered facts as individual dots spread out on graph paper. Without a line to connect them, the dots represent random bits of personal history (which he equates with the rote memorization and regurgitation of historical facts like that which occurs in schools). To Meacham, the main job of human memory is to add a line that connects the memory dots together into a meaningful narrative, which might be graphically portrayed by a gently curving line that undulates around some dots, passes directly through other dots, but does not need to touch all of the dots. The line can assume different curves each time it is drawn, depending on the meaning to be constructed. Further, he argues that in some cases, like when a person needs to reference a personal example to persuade or to expand a discussion, the line comes first and the dots are selected later to support the pre-drawn line. "The implication for remembering is that a meaning, once constructed, has the power not merely

to shape but indeed to bring into existence specific remembered details that appear to serve as support for the meaning" (p. 42). To expand upon this concept, using the case of FBM, it may turn out that when a person becomes aware that it's important (or patriotic) to have an FBM of a particular event, the culture specifies the shape of the curving line. It then becomes that individual's task to search for the dots…for those believable and reasonable memory details…that support the line in and add truthiness to the tale.

When people search their memory for the dots, (for the specific factual details to create a narrative), and come up lacking, there are cognitive structures that might be counted on to help fill in the blanks. In other words, in the absence of specific memory details, people still have generalized memory details they can rely on to create a narrative. Markus (1977) refers to *self-schemata*, which are "cognitive generalizations about the self, derived from past experience, that organize and guide the processing of the self-related information contained in an individual's social experience" (p. 64). Self-schemata may best be described as ever-updating summaries of how things usually are that "represent patterns of behavior that have been observed repeatedly, to the point where a framework is generated that allows one to make inferences from scant information or to quickly streamline and interpret complex sequences of events" (p. 64). Self-schemata can be derived from specific events (e.g., "Yesterday I rushed to the TV for news when I heard that a helicopter crashed") as well as more general representations from redundant events, compiled over time (e.g., "I am a caring person," "I am fascinated by the idea of space exploration," or "I'm patriotic"). For Marcus, self-schemata allow quick access to pre-organized data that can be used when making "judgments, decisions, inferences, or predictions about the self" (p. 64). Since people clearly differ in their past experiences, self-schemata differ widely from person to person.

Similarly, Ross (1989) describes schema-like structures, called "implicit theories" that help to organize memory and allow a person quick access to information. Whereas Markus' self-schemata are quite specific to each individual, Ross' implicit theories are generalized theories

about how the world works, that can then be applied to specific judgments about oneself. Whereas Markus's schemata are gleaned over time by a focus on events in one's own life, Ross' implicit theories are based in social-cultural conceptions of personality and aging. Ross focuses on the importance of two types of implicit theories: those predicting the stability of personality over time, and those predicting that as people age they may gain ability in some attributes and lose ability in others. Because people have a theory that they are essentially the same person over time, "they tend to assume, for example, that their current attitudes are accurate representations of their past opinions" (Ross & Newby-Clark, 1998, p. 134). Thus, a person who may have initially judged an FBM-worthy event as rather insignificant, but later came to believe wholeheartedly that the event was very significant, may be influenced by an implicit theory that such beliefs remain stable and may skew their narrative of having heard the news accordingly.

Cultural influence. In FBM research the role of culture is "often treated implicitly and sometimes is even taken for granted" (Wang & Aydin, 2009, p. 248). If culture is mentioned at all, it's often in the role of provider of the precipitating event where everyone shares in hearing the news; then, like spokes on a wheel, each individual's memories are often characterized as branching off, differing wildly, full of idiosyncratic details. Thus FBMs are often treated as uniquely personal memories that share a common starting point. The other way FBM research views culture is to define sub-groups of people to be studied for their individual FBMs. Sometimes sub-groups are compared with each other to determine which one has the most accurate or most detailed FBMs. However, recent trends in the study of collective memory urge us to examine additional cultural influences. For example, there may be tacitly understood standards for what kind of FBM narratives will be well-received by the group and which type of FBM narratives will face indifference or rejection if shared. There may also be group pressure to have one's own FBM narrative…as well as minor social penalties (e.g., being viewed as less patriotic or less connected to the group) for members who admit to the group that no FBM exists.

The field of collective memory is a rather recent interdisciplinary effort that views memory in its social context (Barnier & Sutton, 2008). Memory is characterized as a two way street where individuals constrain and contribute to collaborative remembering, while at the same time, groups shape individual memories. One of the main ideas is that our social connections help choose and organize what it is we should recall and how we should recall it. In short, members of a group share the same narrative toolkit, which they acquire simply by being a part of and interacting within the group. Bruner (2003) calls it "the myriad expectations that we early, even mindlessly, pick up from the culture in which we are immersed" (p. 65).

In a collective memory vein, Talarico and Rubin (2007) proposed in their concluding remarks that an overarching purpose of FBM (with implications for both a self and a social function), may be to solidify one's connection to a large group or culture: in that each person with their own FBM, tacitly agrees with the group that the event in question is culturally relevant and too important to be forgotten. The implication is that on a national group level, simply having an FBM for a culturally relevant event might be the patriotic thing to do. Wang and Aydin (2009) call this cultural connection "the importance effect." When comparing cultural groups, studies have shown that members of a particular country place more importance on and have more detailed memories for FBM-worthy events in their own country (Curci & Luminet, 2006; Kvavilashvili, Mirani, Schlagman, & Kornbrot, 2003). In other words, the knowledge that fellow group members will be judging an event as highly significant can influence one's own estimation of the FBM-worthiness of the event. Berntsen (2009) relates a personal anecdote to illustrate how culture might have influenced her own FBM formation. Berntsen mentions two FBM-worthy events that were both insignificant to her personally, an earthquake in Iran that killed thousands of Iranians in 2003 when she was about 40 years old (for which she has no FBM) and the death of the King of Denmark when she was 9 years old (for which has a vivid FBM). Since neither event changed her life or the lives of those closest to her, Berntsen proposes that her strong FBM of the King's death is due to her emotional connection to the culture in which she was embedded, for

which the king was the topmost group member. Of course, it could also be argued that Berntsen assessed correctly that the post-event social sharing possibilities for a story about hearing the news of the Iran earthquake were rather limited given her milieu, whereas, being a Dane living in Denmark, the social sharing possibilities for a story about her personal connection to the death of Denmark's king was much higher. In fact, autobiographical memory is often called into service during conversations about a particular topic (such as the death of the king) when each person in turn contributes their own personal anecdote to the discussion when it's their turn to speak in order to "maintain and solidify relationships with a group by telling a story that conforms to the ongoing topic" (Hyman & Faries, 1992, p. 217). It is also possible that the memory of the king's death may function as a benchmark or chapter heading in the story of her life. It is impossible to know, but it is quite likely that Berntsen may have even changed some of the details of her original childhood memory over time, perhaps to make a better story or to make the story more personally meaningful. Also, it is likely that Berntsen's memory of the king's death serves multiple functions, since they are not mutually exclusive. It remains for researchers to move from individual anecdotes of FBM function to a functional analysis of data from several people for the same FBM event, such as with the space shuttle *Challenger* disaster.

Overview and Hypotheses:

After 30 years of research concerning the photographic-like phenomenon of FBM, strong evidence indicates that FBM may actually be no more accurate or long-lasting than ordinary memory. In fact, the most important aspect of FBM may be that people confidently believe they have especially vivid, photographic-like memories of newsworthy events, regardless of accuracy. A functional approach to memory suggests that this disparity between confidence, vividness and accuracy in FBM may shed light onto interesting personal and social reasons why FBMs may change over time, often without the individual even being aware of the changes.

This study will re-examine the data from the Neisser and Harsch (1992) *Challenger* study. Instead of viewing these FBMs as if they were eyewitness testimony to a national space disaster, where the function of each person's FBM is to report the truth and nothing but the truth, this study will view the students' narratives from the perspective of literary autobiography where "the autobiographer's memory and memory failures are informative and contribute to our understanding of reconstructive memory processes" (Barclay, 1986, p. 85).

As stated before, the objective of this study is to discern whether the space shuttle *Challenger* narratives changed over time in ways that make them "better" stories. The first hypothesis is that the narratives change structurally over time in order to better fit conventional story grammars such as coherence, orientation and evaluation. The second hypothesis is that, regardless of story grammar, the details in the narrative change in ways that lend more pizzazz to the story—in order to better engage a listener with a more interesting story for social sharing purposes. The third hypothesis is that the narratives change over time in ways that researchers may judge as inaccurate, but that the students themselves may judge to be more "truthy" to the gist of their own larger autobiographies.

Method

Participants

All of the participants were students at Emory University attending an introductory level psychology course on Personality Theories on January 29, 1986. Just before the class ended the entire group of 106 undergraduates were asked to fill out a 2-page questionnaire (T1) concerning the *Challenger* disaster (which had occurred almost exactly 23 hours earlier). In the Fall of 1988 (about 32 months later) 44 of these undergraduates were still at Emory, beginning their Senior year. At that time the 15 males and 29 females were contacted by phone by either a male (n = 23) or a female (n = 21) experimenter. They were told that their name had been selected from a list of students who had taken an introductory psychology course several years ago. All who were

contacted agreed to come to the psychology department and fill out a 3-page questionnaire (T2) in exchange for $3. At that time, the students were not warned they would be re-interviewed. However, about 6 months later, in the Spring of 1989, 40 of these Seniors participated in an additional verbal interview with the current author. Of the 4 missing students from this final group, 1 male had been unreachable by phone, 1 female failed to return numerous phone messages, 1 female made and then broke 3 separate appointments and 1 female was dropped due to mechanical problems with the tape recorder.

The Original Questionnaire

The original questionnaire (See Appendix A) was given to all the students at the same time in a large lecture hall setting. The instructions explained that the questionnaire was part of ongoing research on memory for important life events. The students were asked to help establish a baseline for what is recalled when people remember how they first heard some major piece of news. They were asked to do this by answering questions about how they themselves first heard the news, "yesterday", that the *Challenger* had exploded. They were given about a third of a page to write their description and were asked to be as full and complete as they could be. Then they were asked to turn the page over and answer 11 specific questions about the circumstances surrounding the event. Several of these questions were based on Brown and Kulik's canonical categories: place, ongoing event, informant (both the medium and the exact person/news program), affect in others, own affect and aftermath. Students were also asked to give specific details concerning the time, the others who were present, and the informant's affect. In order to gauge how much rehearsal had taken place, students were asked to estimate the amount of time they had spent on the previous day talking about the event or following media coverage.

The Fall 1988 Questionnaire

The follow-up questionnaire (see Appendix B) was very similar to the original, day-after questionnaire. Student participants met individually or in small groups with either a male or a

female experimenter who reminded them that their participation was voluntary and that their responses would be held in strict confidence. The instructions explained that the questionnaire was a study of memory for unusual events and that the focus was the explosion of the *Challenger,* which had occurred early in 1986. The students were told not to report their general knowledge of the accident itself, but rather to describe the moment when they first heard about the accident. They were given about a half of a page to write their description and were asked to be as full and complete as they could. Then they were asked to turn to the next page and answer the same 11 specific questions described above. However, after each question, students were asked to rate on a 5 point scale how sure they were of their answer: 1 was defined as "just guessing and don't really remember it at all" and 5 was defined as "absolutely certain about it." Four additional questions concerned the overall amount of rehearsal time, the effect of extensive media coverage on their personal memory, and an assessment of if (and if so where) they had ever previously filled out a questionnaire on their *Challenger* memories. Although participants were given as much time as they needed, this questionnaire generally took less than 20 minutes to finish.

The Spring 1989 Interview

The verbal interview (see Appendix D) is in many ways the crux of the research described in this paper. Once it was determined by the above questionnaires that students made substantial memory errors, this interview was devised to investigate the source of the errors and to guide them back to their original accounts. However, the students were not told that this was the purpose of the study. They were called and asked to participate in a psychology project currently being conducted by a graduate student. Participants were told that their names had been selected from a list of Emory students who had participated in studies in the past and that they would be paid $5 for their current participation. Participants were interviewed individually by the female experimenter who had handed out the second questionnaire; thus, half of the students had met with the same experimenter previously. With the exception of two sets of records that were

used anecdotally during the creation of the interview, the experimenter was blind to the differences between the students' first and second recalls. All conversations were tape-recorded. Participants were reminded that everything they said would be held in strict confidence, and that they could quit at any time if they wished. The interview itself consisted of four parts.

The first part was an oral replication of the written questionnaire's essay question; participants were asked to describe the moment early in 1986 when they first learned that the *Challenger* had exploded. They were asked to make their descriptions as full and complete as possible. If they finished their description quickly, they were asked if there was anything else they could remember. Participants were allowed to respond until they indicated that they had exhausted the topic or until 5 minutes had passed.

The second part of the interview consisted of several specific questions asking the student participants to rate various aspects of their memories (based on Brewer, 1988). First, students were introduced to the concept of making ratings using a seven-point scale. Then they were asked to rate their overall memory of the hearing the news of the *Challenger* on a scale where 1 signified "I have no memory of the event at all" and 7 signified "I am certain that I remember the event." Next, participants were asked several questions designed to measure their personal experience during the recall process. They were asked to make ratings of the following mental experiences: sight, sound, touch, smell, taste, emotion and thought. For these ratings, 1 was defined as "I have no re-experiencing of the original experience" and 7 was defined as "I have an exact re-experience of my original experience." After the visual and auditory ratings, participants were asked to describe just what it was that they were re-experiencing. This was done because of the possible dual situation created by the presence of a TV in many of the recalls. It was felt that students could either be seeing and hearing events from the room containing TV coverage of the disaster, or they could be focusing on the television coverage itself when they reported the strength of their visual and auditory image. The students who focused on the television coverage, might be more influenced by later replaying of the original scenes and sounds by the media over

the next several years. In order to get less media-centered rating of vividness, participants who reported memories which focused on TV coverage were asked to focus on their initial surroundings before making their ratings.

The third part of the interview consisted of various attempts to jog participants' memories—to facilitate recall of any information lost or reconstructed. Before the questions were asked, participants were instructed to report everything, no matter how trivial. Each task was then described by the experimenter until it was clearly understood. Participants were given eight tasks, each with varying relations to the *Challenger* event. Four of the tasks were of the focused type found in Edward Geiselman's (1988) "cognitive interview." They instructed the student to concentrate on different aspects of the event as follows:

1) Reinstate the environmental context
2) Reinstate the emotional context
3) Recall the event backward, from end to beginning
4) Recall the event from a different perspective.

The remaining four tasks were added to induce lateral thinking; they encouraged students to widen their attention away from the event, as if brainstorming. The following tasks were included in order to see if veering away from the inaccurate recollection could remind students of aspects of the original event that they had forgotten because their memories were too narrowly focused on the wrong slice of time:

1) Recall the events of that whole day, before and after the event
2) Discuss an alternate way that you might have heard the news
3) Discuss a possible way that a friend might have heard about it
4) Recall the events of that January.

Participants were divided into two groups; one group received the focused questions first, and one group received the lateral questions first. Both groups contained equal numbers of

students making large, small and no errors. After each group of four questions, the participants were asked if they now recalled anything more about hearing the first time they heard the news.

The last part of the interview was an attempt to understand the origins of errors in recall. Participants were used as collaborators and were encouraged to suggest reasons for changes in their memories. They were shown their original written statements and were asked to explain any differences that emerged. First they were allowed to view their second questionnaire (T2). Since this was the first time the experimenter (the current author) had seen the questionnaire, both read it through together, and participants were asked to point out and explain any differences between it and their recent verbal interview (T3). Then, participants were read a question, prepared in advance by Dr. Neisser, based on the differences between interviews 1 and 2. This gave each student one last, blatant cue toward her or his original response from the day after the event. For example, the cue for one student who had shifted the time of the event was "Is it possible that you already heard the news in some other way before your friend came in?" An example used for a student who had shifted the location of the event was "Is it possible that you could have been anywhere else—like at Emory—when you heard the news—rather than at home?" Once participants had responded to the question, they were asked to explain what evidence they had used when answering. In other words, they were asked to speculate on how they knew they were giving accurate accounts of what had happened.

Once the discussion of the second questionnaire had ended, the students were asked if they remembered filling out any other questionnaires on the shuttle disaster. If they still did not remember, they were told the name of the class and the professor during which the questionnaire was handed out. Finally, the participants and the experimenter read the original hand-written report together. Again, this was the first time the experimenter had seen the questionnaire. The participants were encouraged to comment on anything they found interesting about the report and were especially encouraged to speculate on what caused the differences over time. If the student did not notice a particular difference between the two reports, the experimenter asked the

question, “Why do you suppose you said this here and something different a couple years ago?” After the discussion of the original questionnaire (T1) had ended, students were asked whether they now pictured the event as they had recorded it on the day after, or whether they still pictured it in some other way. Similarly, they were asked which version of the event they liked better and they believed more.

Finally, as a gauge of personal interest in the topic of space shuttle launches prior to the disaster, students were asked to give their opinions of NASA, the space program and science fiction. Participants were allowed as much time as they wanted to answer the questions. Then they were thanked and given $5 for their participation. Any questions they had about the study were answered at this time. With one exception, all interviews lasted less than 45 minutes. The interviews were then transcribed.

The Original Coding Procedure

Analyzing these changes in FBMs over time turned out to be very complex. It wasn’t possible to sort the students’ responses into two distinct groups labeled accurate and inaccurate, because each student’s recollection seemed partly right and partly wrong. Nor was it possible to sort the memories using some sort of global accuracy scale—it was tried, but it proved to be unreliable. Eventually, we devised the WAS (Weighted Attributes Scale) based on comparing 5 distinct attributes, one at a time, and then grouping the attribute judgments together for one overall accuracy score.

Our scoring system was modeled on Brown and Kulik’s (1977) idea that there are “canonical categories”—although our categories differed somewhat from theirs. Like Brown and Kulik, we included the categories of place, activity (cf. “ongoing event”) and informant in our analysis. However, we omitted the categories Own Affect and Affect in Others because the ubiquitous responses of “shocked & stunned” were not very informative. We also omitted the category “Aftermath” because there seemed to be not just one, but many possible activities that

each student could remember having done after having heard the news. We coded two other attributes: time, which influenced the organization of the day's events, and others present, which formed part of the story's visual backdrop.

Coders searched each questionnaire and transcript for the 5 attributes (place, activity, informant, time and others present). On the questionnaires, these attributes were abstracted from the free recall paragraph and from responses to specific questions. On the transcripts, coders searched from the beginning of the interview until just before each student was confronted with her/his previous questionnaires. Once abstracted, the attributes were rated for similarity using a 3–point scale. A rating of 2 meant that the attribute was exactly the same on both reports (e.g., "studying" is considered the same as "sitting at my desk" for activity, "an ABC newsflash" is considered the same as "an NBC newsflash" for informant). A zero meant that the attribute was totally different each time (e.g., "walking to the dorm" rather than "sitting and eating" for activity, "seeing the news on TV" rather than "hearing it from a friend" for informant). Ratings of 1 meant the attribute differed slightly across reports or it was simply too vague to judge for certain (e.g., "sitting and eating" and "sitting and talking" for activity, "my best friend told me" and "either Alice or my roommate told me" for informant). Although all 5 attributes were rated in this way, not all 5 ratings were equally important to the overall accuracy score. Three of the attributes (place, activity and informant) seemed vital to the integrity of the memory. When one of these "major attributes" changes, the whole visual memory must dissolve and reform to accommodate the new information. However, when a minor attribute (time and others present) changes, the visual picture can simply be retouched, as with an airbrush, and the integrity of the event is preserved. Using this distinction, overall accuracy was judged using the Weighted Attribute Score (WAS) that valued the major attributes more than the minors. The ratings on the three major attributes were added together, and a single additional point was awarded if the student rated 3 or more (out of 4) on the minors. The result was an accuracy rating for each pair of interviews on the WAS scale of between 0 (totally inaccurate) and 7 (totally accurate).

Since there were three separate interviews there were three separate comparisons. Comparing the Fall 1988 (T2) answers with the Original, Day-After (T1) accounts yielded accuracy scores for 44 students (WAS—T2/T1). Two coders (the present author and postdoctoral student David Jopling) independently coded WAS—T2/T1 for all 44 participants and achieved a reliability of .79. The two coders then resolved all disputed cases. A naïve third coder (honors program undergraduate Julie Dunsmore) was trained and her ratings correlated .89 with the resolved ratings of the first two coders. Comparing the Spring 1989 (T3) answers with the Original, Day-After (T1) accounts yielded accuracy scores for 40 students (WAS—T3/T1). The first two coders once again independently coded data from all 40 students (WAS—T3/T1) and achieved a reliability of .96. Differences were discussed and resolved. Finally the same scheme was used to examine consistency across the Fall 1988 and Spring 1989 recall sessions. Again, the original two coders independently assigned consistency scores (WAS—T3/T2) for all 40 subjects and achieved a reliability of .94. Differences were discussed and resolved.

Findings from the Original 1992 Analyses

Analyses from the Neisser and Harsch (1992) study allows us to rather thoroughly characterize the FBMs of these study participants. Since these characterizations will be used later to understand aspects of the narrative analysis, a very brief description of the main findings is warranted. A more in-depth analysis can be found in the original paper.

Clearly, the *Challenger* disaster evoked the flashbulb memory phenomenon in these students. On the 1986 day-after questionnaire, all 44 students clearly recalled the circumstances and all 44 provided information for all three major attributes. On the Fall 1988 questionnaire (T2), only one student indicated she was not certain she clearly recalled the circumstances of first hearing the news—although she then went on to provide at least one major and minor attribute (canonical category) of the event. On the Spring 1989 interview (T3), that same student and two

others indicated they did not clearly recall the circumstances of first hearing the news, although all three went on to provide information for several attributes.

In the Fall of 1988 and again in the Spring of 1989 most students were very confident that they accurately remembered the event. The mean confidence score was 4.17 (out of 5) in 1988 and 5.28 (out of 7) in 1989. However, there was no significant relation between confidence and accuracy. In addition, most students indicated relatively high visual imagery ($M = 5.35$) at T2 when asked (during the 1989 Interview) to rate the degree to which they mentally re-experienced the event on a seven 7–point scale. However, there was no indication that visual vividness was related to accurate recall. Nonetheless, visual vividness was related to the students' confidence in their overall memories [$r = .523$, $p < .01$] on the 1989 interview (T3). In other words, the students with the best visual re-experience of the event exhibited more confidence in their memory of the event, regardless of the memory's accuracy.

Of course, the main finding of the initial study is that, when compared with their original day-after memories of the event, students' Fall 1988 and Spring 1989 flashbulb accounts are filled with inaccurate information. However, regardless of accuracy, once they'd locked into a narrative, the details remained remarkably consistent from the Fall 1988 (T2) to Spring 1989 (T3) semesters. The mean accuracy rating in the Spring (2.75) was nearly the same as in the Fall ($M = 2.95$), [$t\ (38) = 0.545$, $p < .01$]. The two "essentially correct" students who rated a perfect 7 on WAS—T3/T1 had previously rated a perfect 7 on WAS—T2/T1. In fact, most students' overall accuracy scores remained about the same [$r = .954$, $p < .01$]. Of 40 students, 32 (80%) received exactly the same score on WAS—T3/T1 as they did on WAS—T2/T1. Seven students received lower accuracy scores on the spring interview (two students fell from 2 to 0; one subject fell from 4 to 1; one subject fell from 5 to 4; and two students fell from 6 to 5) indicating a slight trend for the reports to become even more inaccurate during the more effusive verbal format. Two students' scores rose (from a 5 to a 6 and from a 3 to a 4). A closer examination revealed that during the verbal interview both students whose scores rose provided more codeable

information (specific rather than general details) than they had written in the Fall. For example, in the interview Subject #44 provided a specific hour for time (rather than "late afternoon"); this increased the time attribute rating from a 1 to a 2 which allowed the bonus point for minor attributes to now be awarded, thus increasing the WAS by one point.

Consistency was significantly related to confidence. Students who settled on a consistent story of the event (as judged by WAS—T3/T2) expressed more confidence in their stories both on the 1988 questionnaire [$r(38) = .633$, $p < .01$] and the 1989 interview [$r(38) = .544$, $p < .05$].

To sum up, the original analyses indicated that these students' memories of the *Challenger* disaster were highly confident, highly vivid and highly inaccurate. The new narrative coding (below) analyzed whether these vivid but inaccurate *Challenger* memories make good narrative tales, and whether the goodness of these tales changed over time.

New Narrative Coding

The narratives that form the crux of this research were extracted from the beginning of each of the three original interviews, in which subjects were asked to describe in a paragraph or two how they heard the news of the *Challenger* disaster. These narratives, transcribed and removed from their original context, formed the basis of the new analyses. To avoid experimenter bias, all the hand-written descriptions from 1986 (T1) and 1988 (T2) questionnaires were re-formatted and printed and the transcribed verbal narratives from 1989 (T3) interview were reformatted and printed, one per page, on a sheet of white paper, with only a randomized number at the top, standing as a numerical code to indicate the subject and interview. Although there were no outward references to which narratives were originally written and which were verbal, it was often easy to tell by the language used.

In keeping with the three hypotheses, narrative coding also involved a three-pronged approach. First, all the narratives were coded using traditional structural coding schemes to investigate whether memories changed over time in order to better fit typical story grammars.

Three common assessments of typical story grammar were used: coherence, orientation and evaluation. Next, all the narratives were coded using the common story-telling convention that good tales have pizzazz, in order to investigate whether memories changed over time in ways that made the stories more unique and interesting to a listener. The third prong examined, not the narratives themselves, but the students' responses in the oral interview as they viewed their day-after hand-written narratives and explained how and why they thought their narratives changed over time, as well as how much they were surprised by any of said changes.

Coding for coherence. The FBM narratives from all three time periods (T1, T2 & T3) were examined to see if they changed to become more coherent stories. Research by Mandler and DeForest (1979) indicates that story-tellers, from first-graders on, rely heavily during recall on the canonical forms of stories; narrators use their knowledge of what should happen next in a story when searching their memory for what detail to tell next, and what detail to add after that. The story grammars or "nodes" developed in cognitive psychology have their roots in linguistics (Graesser, Golding & Long, 1996) and commonly include categories such as "beginning, reaction, attempt, outcome and ending" (Mandler & Johnson (1977) that parallel Bruner's (2006) template, and Aristotle's *peripeteia*. Narratives were coded using a dimensional coding scale which rated coherence on five of the structural classification patterns defined by Peterson and McCabe (1983; cited in Fivush, Hazzard, Sales, Sarfati, & Brown, 2003):

Score	Label	Rules for Coding Coherence
0	Disoriented	Narrative is too confused, disoriented or contradictory for the listener to understand.
1	Impoverished	Narrative consists of too few sentences for any pattern to emerge.
2	Chronological	Narrative describes successive events that are sequentially and/or logically ordered.
3	Ending-at-the-high-point	Narrative builds to a climactic high point, then ends; there is no 'wrap-up' or resolution.
4	Classic pattern	Narrative builds to a high point, dwells on it for evaluative purposes, then resolves it.

Two judges (the present author and lab assistant Kelly Tracey who was naïve to the hypotheses) independently coded 25% of the narratives (N = 24) with high reliability (Cronbach's Alpha = .898). Both judges then independently coded all of the remaining transcripts and achieved high agreement (Cronbach's Alpha = .881) on the whole set (N = 116). The judges then discussed and resolved all disputed cases to attain a final score for each participant. (See Appendices E, F, G, & H for examples of student narratives and their assigned coherence scores.)

Coding for orientation. The FBM narratives from all three time periods were examined to see if they included clauses that helped set the stage for the people, place(s), time(s) and ongoing behavior in the narrative. Memories were coded using a dimensional coding scale that rated orientation on a three-point scale developed by O'Kearney, Speyer, and Kenardy (2007) as follows:

Score	Rules for Coding Orientation
0	The narrative includes no orientation comments or minimal information such as one statement referring to the setting or context of the events
1	The narrative provides enough orientation information to gain a general sense of who, when and where the events took place (or at least two of these pieces of information).
2	The narrative provides precise information about the time of day, location, people involved, general conditions, etc.

The same two judges as above (the present author and naïve coder Kelly Tracey) independently coded 25% of the narratives (N = 24) for orientation with high reliability (Cronbach's Alpha = .867). Each judge then independently coded all of the remaining narratives and achieved high agreement (Cronbach's Alpha = .913) on the full set of narratives (N = 116). The judges then discussed and resolved the disputed codes to attain a final coding score for each participant (see Appendices E, F, G, & H).

Coding for evaluation. The FBM narratives from all three time periods were examined to see if they included clauses that gave the point of the narrative: why it was told or what to think about a person, place, thing, event or entire experience as developed by O'Kearney, Speyer, and Kenardy (2007). Examples include clauses that give information about a student's intentions, explanations, judgments and experienced emotion.

Score	Rules for Coding Evaluation
0	The narrative contained none or very little evaluation and consisted mainly of facts or a series of actions.
1	The narrative contained some evaluative comments, usually in the form of internal emotional states or intentions
2	The narrative contained detailed evaluative comments telling the reader what to think about the event being narrated.

The same two judges (the present author and naïve coder Kelly Tracey) independently coded 25% of the narratives (N = 24) with high reliability (Cronbach's Alpha = .950). Each judge then independently coded all of the transcripts (N = 116) and achieved high agreement (Cronbach's Alpha = .903). The judges then discussed and resolved the disputed codes to attain a final coding score for each participant (see Appendices E, F, G, & H).

Coding for pizzazz. Developing a coding scheme to reliably capture pizzazz is challenging. What interests or seems pizzazzy to one person may not interest another, just as what interests a person on one day may change the next. Still, we were able to develop a set of common guidelines that could be applied to standardize the coding of pizzazz. In the most general terms, narratives judged to have a low level of pizzazz included those stories that hardly varied from a prototypical *peripetea* story such as: I was going about my day when I heard news that shocked me, so I went to seek out information to make sense of the disturbance before returning to my normal activities. Though structurally coherent, such a narrative, which could basically be any college student's story, is clearly an un-interesting, bare bones account with no

pizzazz. In contrast, in order to score higher on the pizzazz scale, the narrative had to include any detail that set the narrative apart or made it unique to a specific student. Examples of interesting details common to literary sources that we used as our guide (King, 2003) suggested pizzazz could be found in unusual settings, unusual character reactions, asides that bring in extra information, or styles of story-telling that invited the reader to feel a personal connection to the tale. Narratives were coded using the dimensional coding scale below, which rated pizzazz on a three-point scale:

Score	Rules for Coding Pizzazz
0	The narrative contained no interesting or unique clauses that set it apart.
1	The narrative included one interesting story detail, an unusual setting, an unusual reaction, or a quirky or remarkable aside, that peaked the reader's interest a little.
2	The narrative contained two or more interesting story details, an unusual setting, an unusual reaction, or a quirky or remarkable aside, that instilled in the reader a desire to follow-up or read more.

The same two judges as above (the present author and naïve coder Kelly Tracey) independently coded 25% of the narratives (N = 24) with high reliability (Cronbach's Alpha = .939). Each judge then coded all of the transcripts (N = 116) and achieved high agreement (Cronbach's Alpha = .861). The judges then discussed and resolved the disputed codes to attain a final coding score for each participant (see Appendices E, F, G, & H).

Coding student explanations. Because the narratives themselves were simple stories of hearing the news, they did not contain any indication of how truthy the stories felt to the narrators. Thus, in order to investigate Hypothesis 3, that the narratives change to become more truthy over time, the investigation shifted from the narratives to the section at the end of the verbal interview (T3) where students were shown their original handwritten questionnaires and were given the chance to explain what they thought accounted for any differences they noticed.

To avoid experimenter bias, the relevant end sections of the verbal interviews (T3) were excerpted and printed separately, with only a randomized numerical subject code at the top.

Six categories were developed to capture the metamemory comments that participants made as they reconciled the differences between their current memories (T3) and their day-after (T1) accounts of the events. All of the students' explanations as to why there were differences fit into the six categories below.

Category	Rules for Coding Student Explanations
T1 Error	I must have made an error (at T1) when I wrote it down on the day after the event, which I've since corrected…or perhaps I just didn't take T1 seriously at the time.
Logical omission	I simply forgot or omitted unimportant details. It's no big deal.
Self-knowledge:	Subject searches self-knowledge and offers a truthy detail known now (at T3) about life and the general milieu back then.
Visual Image:	T1 doesn't match the visual image I now see in my mind at T3.
Time slice:	Both versions (T1 and T3) actually happened at different times.
Can't deny the evidence	Logically, my handwritten, day-after account (T1) must be accurate, but I still just don't remember it happening that way.

The initial strategy involved coding every response from every student that fit into any of the six categories, but this method proved too difficult to reliably code as the subjects often shifted back and forth between explanations, sometimes repeating explanations using different examples and other times restating explanations using the same example over and over. Thus, the coding strategy was simplified so that coders judged simply yes or no as to whether a student had used a particular explanation any time during the discussion of the differences between T3 and T1. Regardless of whether there were a half-dozen comments that fit into a particular category or only one comment, a student received a yes code for having used that explanation at least once. (See also Appendices G, H & I for excerpts of student interviews showing how we coded their explanations and metamemory content.) Eventually, the same two judges as above (the present

author and Kelly Tracey) independently coded 20% of the narratives (N = 8) with good reliability (91.67% agreement; Cohen's Kappa = .708). Each judge then independently coded all of the transcripts and achieved good reliability (93.33% agreement; Cohen's Kappa = .791) on the whole set (N = 40). The judges then discussed and resolved the disputed codes to attain a final score for each participant.

Coding for surprise: At the end of the verbal interview (T3), when students were shown their original handwritten questionnaires, students often expressed surprise at the differences in their narratives over time. These statements of surprise were spontaneous and interwoven throughout the discussion of differences. During coding, two distinctly different types of surprise emerged. On one hand, many students expressed surprise that they had ever filled out a questionnaire during a psychology class on the day after the *Challenger* event. We termed this "questionnaire surprise" and did not code for it. The second kind of surprise (that we coded for) concerned students' reactions to the actual changes in their memories over time. We developed a coding scheme to capture three levels of surprise:

Score	Rules for Coding Surprise
0	The participant expressed little or no surprise and/or indicated any difference found was minor or logical.
1	The participant expressed general surprise on one occasion or specific surprise on one detail.
2	The participant repeatedly indicated surprise with two or more comments such as "that's really weird" or "I don't believe it" or voiced exclamations such as "Oh my God!" or "Whoa!"

The same two judges as above (the present author and naïve coder Kelly Tracey) separately read through the end of each T3 transcript and highlighted any expressions of surprise that appeared. Each student was then given a rating by each judge and the ratings were later compared. The judges independently coded 20% of the narratives (N = 8) with high reliability (Cronbach's Alpha = .875). Each judge then independently coded all of the transcripts (N = 40) and achieved

high agreement (Cronbach's Alpha = .839). The judges then discussed and resolved the disputed codes to attain a final surprise score for each participant.

Results

The presentation of results is divided into four major sections. The first section contains an analysis of word count. It is important to consider the effect of word count across interviews, because varying interview format (written or verbal) differentially shapes the length and perhaps also the content of the narratives. The second section presents the results from the new narrative coding schemes. More specifically, this second section considers first whether common assessments of story grammar (coherence, orientation and evaluation) change over time, as posited in hypothesis #1, then considers next whether good story-telling conventions (pizzazz) change over time, as posited in hypothesis #2. The third section seeks to better characterize the narratives by presenting correlational data that compares the narrative variables with each other within interviews and then compares the narrative variables to variables from the original 1992 study (vividness, confidence, accuracy and consistency). Finally, the fourth section investigates hypothesis #3 that student narratives may change in ways that make them more true to the individual's self-knowledge. Although none of the original interviews specifically asked the students for a measure of truthiness, the responses given by students when they are shown their own hand-written narratives (and are asked to explain the differences they spot), contain explanations about which details of the original memory changed over time to become more truthy. Also interwoven within students' explanations of differences were spontaneous expressions of surprise, which were also examined.

It is important to note that 40 students were interviewed at three times, yielding 120 *possible* narratives. However, at T1 (the day after the *Challenger* event) four students skipped the first question (which asked them to write a narrative paragraph) and went straight to answering specific questions about who, what, where and when. Thus, 4 of the 40 students at T1

gave detailed information about their experience of hearing the *Challenger* news, without including a narrative paragraph, yielding 36 students who completed all 3 narratives over all three times. The ANOVAs, ANCOVAs, means (standard deviations) and *t* tests reported below are for 36 students, unless otherwise stated.

Although no predictions have been made about gender as a contributing factor, previous research indicates that females often report autobiographical memories differently than males (Cross & Madson, 1997; see also Bauer, Stennes & Haight, 2003; Ely & Ryan, 2008), and so a comparison of the results by gender is also included.

Word Count

The first narrative analyses were to determine whether the different interview formats (written and verbal) affected the length of the narratives given. Table 1 (below) shows the means (and standard deviations) for word count. A quick glance indicates that the third interview (T3), which was the oral interview, contained about twice as many words as the written interviews (T1 & T2) for both males and females and that females consistently averaged a few more words than males at every interview.

Table 1: Means (standard deviations) for word count across all three times.

	Combined N = 36	Female N = 23	Male N = 13
	Mean (SD)	Mean (SD)	Mean (SD)
Word Count T1	**63.67 (30.84)**	67.13 (24.54)	57.54 (40.07)
Word Count T2	**72.44 (40.20)**	73.70 (44.33)	70.23 (33.19)
Word Count T3	**157.08 (93.24)**	168.04 (79.58)	137.69 (114.48)

In order to determine if there were significant length or gender differences in word count over time, a 2 (gender: male, female) by 3 (interview: T1, T2, T3) repeated measures ANOVA was performed. It yielded a significant main effect for interview [$F(2, 34) = 31.86$, $p < .001$], but no

significant effect of gender [$F(2, 34) = .844$, $p = .365$] and no significant interaction between interview and gender [$F(2, 34) = .640$, $p = .531$]. Follow-up repeated measures t-tests confirmed that the third interview was longer than both the first [$t(35) = 7.14$, $p < .01$] and the second [$t(35) = 5.87$, $p < .01$] interviews; however, the first and second interviews did not differ from each other [$t(35) = 1.29$, $p = .206$]. Thus, it seems likely there was something about the verbal format that encouraged participants to use more words when telling their stories.

Table 2 (below) shows that word count correlated positively with all of the new narrative coding measures (coherence, orientation, evaluation & pizzazz) at almost every time. In general, the more words that were written or spoken, the more likely the narrative received a higher score on measures of coherence, orientation, evaluation and pizzazz. Thus, word count was used as a covariate in all analyses. Interestingly, the one place that word count did not correlate with coherence was on the oral interview (T3).

Table 2: Correlations of word count and the narrative coding variables.

	Coherence	Orientation	Evaluation	Pizzazz
T1 (N = 36) Word Count	**0.606**	**0.542**	**0.345**	**0.753**
T2 (N = 40) Word Count	**0.663**	**0.392**	**0.521**	**0.742**
T3 (N = 40) Word Count	0.285	**0.448**	**0.429**	**0.479**

Narrative structure

Coherence. The next analyses examine the hypothesis that students' narratives changed over time to become more coherent. Table 3 (below) shows the means (and standard deviations) for the measure of coherence.

Table 3: Means (standard deviations) for coherence across all three times.

	Combined N = 36	Female N = 23	Male N = 13
	Mean (SD)	Mean (SD)	Mean (SD)
Coherence T1	3.56 (0.94)	3.78 (0.85)	3.15 (0.99)
Coherence T2	3.67 (0.99)	3.74 (1.10)	3.54 (0.78)
Coherence T3	3.50 (1.08)	3.61 (1.23)	3.31 (0.75)

In order to examine if the narratives changed significantly in coherence over time a 2 (gender: male, female) by 3 (interview: T1, T2, T3) repeated measures ANCOVA was conducted, using word count as a varying covariate. The ANCOVA showed no effects for gender [$F(1, 33) = 1.49$, $p = .23$], nor for interview [$F(2, 67) = 2.36$, $p = .10$], nor for a two-way interaction between gender and interview [$F(2, 67) = 0.68$, $p = .51$]. Given that coherence was judged on a 5-point scale (0–4), where a score of 4 was the highest rating, it appears that, most students were giving coherent narratives across all three interviews.

Orientation. The next analyses examined the hypothesis that students' narratives changed over time to include the kind of orienting details that help set the scene. Table 3 (below) shows the means (and standard deviations) for the measure of orientation.

Table 4: Means (standard deviations) for orientation across all three times.

	Combined N = 36	Female N = 23	Male N = 13
	Mean (SD)	Mean (SD)	Mean (SD)
Orientation T1	.81 (.82)	0.78 (.85)	.85 (.80)
Orientation T2	0.86 (0.80)	0.91 (0.79)	0.77 (0.83)
Orientation T3	1.17 (0.77)	1.13 (0.81)	1.23 (0.73)

A 2 (gender: male, female) x 3 (interview: T1, T2, T3) repeated measures ANCOVA was conducted on orientation using word count as a varying covariate. The ANCOVA showed no

effects for gender [$F(1, 33) = 0.38$, $p = .54$], nor for interview [$F(2, 67) = 0.06$, $p = .94$], nor for a two-way interaction between gender and interview [$F(2, 67) = 0.55$, $p = .58$]. Given that orientation was judged on a 3-point scale (0–2), where a score of 2 was the highest rating, it appears that, students gave moderately orienting narratives across all three interviews.

Evaluation. The next analyses examined the hypothesis that students' narratives changed over time to include the kind of evaluative details that characterize the emotional weight of the event. Analyses were run to examine whether the students' narratives changed over time to become more evaluative. Table 5 (below) shows the means (and standard deviations) for the measure of evaluation.

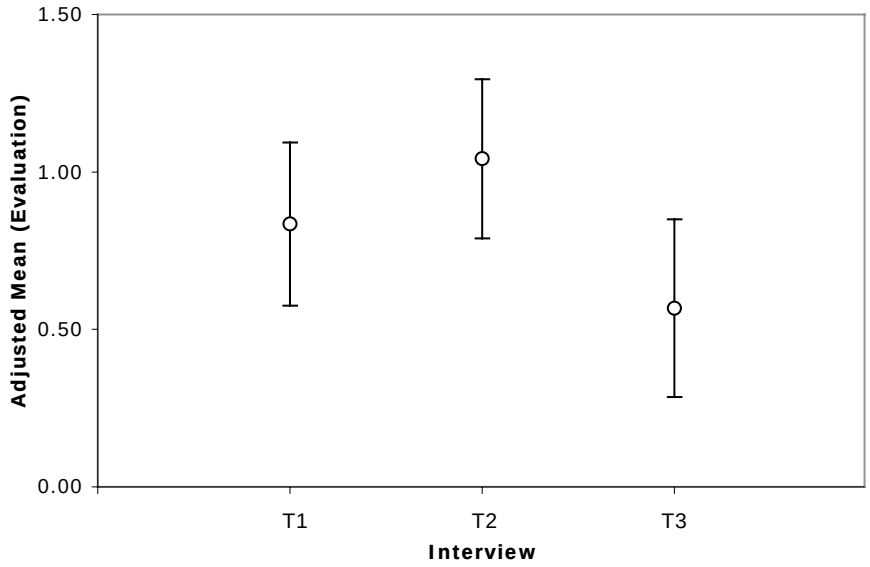
Table 5: Means (standard deviations) for evaluation across all three times.

	Combined N = 36	Female N = 23	Male N = 13
	Mean (SD)	Mean (SD)	Mean (SD)
Evaluation T1	0.67 (0.79)	0.70 (0.82)	0.62 (0.77)
Evaluation T2	0.92 (0.81)	0.91 (0.79)	0.92 (0.86)
Evaluation T3	0.86 (0.81)	1.00 (0.85)	0.62 (0.65)

A 2 (gender: male, female) x 3 (interview: T1, T2, T3) repeated measures ANCOVA was conducted on evaluation using word count as a varying covariate. The ANCOVA showed no effect for gender [$F(1, 33) = 0.22$, $p = .64$], and no interaction between gender and interview [$F(2, 67) = 0.34$, $p = .72$]. However, the ANCOVA revealed a main effect of interview [$F(2, 67) = 3.57$, $p = .03$]. To follow up, a repeated measures ANCOVA was conducted on interview (T1, T2, T3) to evaluate the pairwise differences among the adjusted means, keeping word count as a varying covariate. Only one pairwise comparison was significant when word count was controlled for as a varying covariate: evaluation at T2 was significantly higher than evaluation at T3 [$F(1, 104) = 5.55$, $p = .02$]. Figure 1 (below) graphically compares the adjusted means of the evaluation scores when word count is a covariate. With respect to the adjusted

means, the day-after, written interviews (T1) revealed a moderate level (M = .84) of evaluative comments, on a 3-point scale (0–2). The students' narratives contained the most evaluative comments (M = 1.04) on the second written interview (T2) and the least evaluative comments (M = .57) on the verbal interview (T3).

Figure 1: Adjusted means (standard error) for evaluation across all times.



Pizzazz:

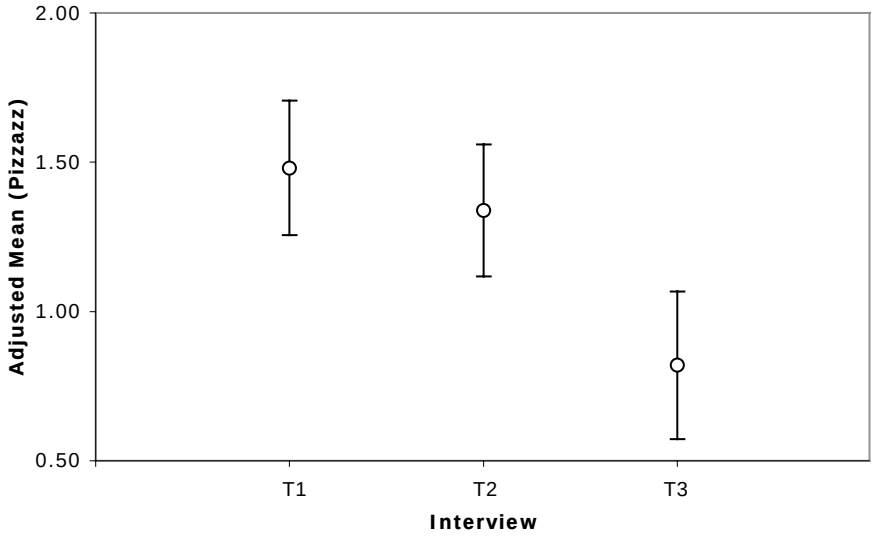
The next analyses examined the hypothesis that students' narratives changed over time to include the kind of details that make a story more interesting when shared. Analyses were run to examine whether the students' narratives gained more pizzazz over time. Table 6 (below) shows the means (and standard deviations) for the measure of pizzazz.

Table 6: Means (standard deviations) for pizzazz across all three times.

	Combined	Female	Male
	Mean (SD)	Mean (SD)	Mean (SD)
Pizzazz T1	1.25 (0.73)	1.35 (0.65)	1.08 (0.86)
Pizzazz T2	1.17 (0.81)	1.26 (0.81)	1.00 (0.82)
Pizzazz T3	1.22 (0.76)	1.26 (0.75)	1.15 (0.80)

In order to examine if pizzazz changed over time a 2 (gender: male, female) x 3 (interview: T1, T2, T3) repeated measures analysis of covariance (ANCOVA) was conducted on pizzazz using word count as a varying covariate. The ANCOVA showed no effect for gender ($F(1, 33) = 0.48$, $p = .49$, nor for a two-way interaction between gender and interview ($F(2, 67) = 0.62$, $p = .54$). However, the ANCOVA revealed a main effect of interview ($F(2, 67) = 3.32$, $p = .04$). Follow-up tests revealed that two pairwise comparisons were significant when word count was controlled for as a varying covariate. Pizzazz at T2 was greater than pizzazz at T3 [$F(1, 104) = 8.60$, $p < .004$] and pizzazz at T1 was greater than pizzazz at T3 [$F(1, 104) = 13.282$, $p < .001$]. Thus, when adjusted for word count, the verbal narratives at T3 were rated as having much less pizzazz ($M = .82$) than either the narratives written the day after at T1 ($M = 1.48$) or the narratives written 2.5 years after at T2 ($M = 1.39$). This seems to refute the hypothesis that the narratives gain more pizzazz. In fact, the narratives appear to lose pizzazz on the third interview.

Figure 2: Adjusted means (standard error) for pizzazz across all times.



In summary, over all three interviews, students told narratives of hearing the news of the space shuttle *Challenger* explosion that were quite coherent and reasonably well oriented.

However, on the third interview, which was a verbal interview, students told less interesting narratives that contained less evaluative comments than they did on the previous two elicitations.

Within-narrative correlations:

In order to better characterize the narratives, correlation coefficients were computed between the new narrative variables (coherence, orientation, evaluation, pizzazz) at each interview. In other words, the measure of coherence at T1 was compared with the measures of orientation, evaluation and pizzazz at T1, and so on with T2 and T3. The correlation matrix presented in Table 7 (below) reveals 12 significant correlations.

For the narratives written on the day-after the event (T1), there was a strong correlation between evaluation and coherence [$r(34) = .601$, $p < .01$)]. This is not surprising because a sense of building to an emotional highpoint was integral to the stories coded as most coherent. Also at T1, pizzazz correlated with coherence [$r(34) = .582$, $p < .01$)] and evaluation [$r(34) = .492$, $p < .01$)], suggesting that the most interesting narratives written on the day after the event tended to be coherent stories that provided details about the setting and the experienced emotions.

Table 7: Correlations of the new narrative coding variables with each other by interview.

		Coherence	Orientation	Evaluation
T1	Orientation	0.292		
(N = 36)	Evaluation	**0.601**	0.029	
	Pizzazz	**0.582**	0.321	**0.492**
T2	Orientation	0.277		
(N = 40)	Evaluation	**0.502**	-0.021	
	Pizzazz	**0.652**	0.220	**0.510**
T3	Orientation	**0.359**		
(N = 40)	Evaluation	**0.581**	0.299	
	Pizzazz	**0.603**	**0.349**	**0.722**

As with the day-after narratives, for the narratives written 2.5 years after the event (T2), there was a strong correlation between evaluation and coherence [$r(38) = .502$, $p < .01$)]. Also, at T2, pizzazz correlated with coherence [$r(38) = .652$, $p < .01$)] and evaluation [$r(38) = .510$, $p < .01$)], suggesting that the most interesting narratives at T2 tended to be those coherent stories that provided details about the emotions experienced at the event.

Again, similar to the previous narratives, for the verbal narratives given 3 years after the event (T3), there was a strong correlation between evaluation and coherence [$r(38) = .581$, $p < .01$)]. In addition, there was also a significant correlation between orientation and coherence [$r(38) = .359$, $p < .02$)] that was not seen in the earlier narratives. Also at T3, pizzazz correlated with coherence [$r(38) = .603$, $p < .01$)], orientation [$r(38) = .349$, $p < .05$)], and evaluation [$r(38) = .772$, $p < .01$)], suggesting that interesting verbal narratives at T3 tended to be coherent stories that provided details about the setting and the experienced emotions.

In summary, over all three interviews, the narratives variables appeared quite interconnected. For example, at T1 and T3 the narratives with higher pizzazz also had higher levels of coherence and evaluation. At T2 the narratives with higher pizzazz also had higher levels of coherence and evaluation. However, at none of the three interviews did narratives with higher levels of orientation correlate significantly with higher levels of evaluation. There appear to be two types of narratives: those that set the scene well (high orientation scores), and those that describe the emotions well (high evaluative scores); the more emotional (evaluative) narratives seem also to be those judged as more interesting (receiving higher pizzazz scores).

Between-narrative variable correlations:

In order to better characterize individual differences in the narratives over time, correlation coefficients were computed for each of the narrative variables (coherence, orientation, evaluation, pizzazz) at each interview. In other words, to determine if consistently good story-tellers gave coherent narratives at each time, the measure of coherence at T1 was compared with

the measures of coherence at T2 and T3 and so on with each variable. The correlation matrix presented in Table 8 (below) reveals three significant correlations.

Table 8: Correlation of each narrative variable across interviews (N = 36).

	Coherence T1	Coherence T2
Coherence T2	0.298	
Coherence T3	0.141	**0.375**

	Orientation T1	Orientation T2
Orientation T2	0.219	
Orientation T3	0.097	**0.593**

	Evaluation T1	Evaluation T2
Evaluation T2	**0.358**	
Evaluation T3	0.196	0.159

	Pizzazz T1	Pizzazz T1
Pizzazz T2	0.313	
Pizzazz T3	0.154	0.263

Analyses comparing across the two written interviews (T1 & T2) reveals a significant correlation only for evaluation, [$r(34) = .358$, $p < .05$)]. Analyses comparing across the two narratives that were more distant from the event (T2 & T3) reveals a significant correlation for coherence [$r(38) = .375$, $p < .05$)] and a significant correlation for orientation [$r(38) = .593$, $p < .01$)]. Interestingly, there were no significant correlations for the variable pizzazz.

In summary, examining the students' narratives for the individual variables does not reveal a group of students who could be characterized as masterfully coherent (or orienting or evaluative or pizzazzy) when narrating their *Challenger* memories across all three interviews.

Relating narrative coding to confidence and vividness.

In addition to giving a narrative account, participants were asked (at T2 and T3) to rate how confident they were in their memories. And then, (only at T3), students were asked to rate

how vividly they re-experienced the original sights, sounds, tastes, smells, tactile sensations, emotions and thoughts associated with their memories. Thus, it was possible to compare whether any of these subjective self-ratings of memory related to any of the narrative variables at any of the three time periods. Correlation coefficients were computed between the new narrative variables (coherence, orientation, evaluation, and pizzazz) and the self-report ratings from the original 1992 *Challenger* study (confidence and vividness). There were 16 significant correlations. For the sake of clarity, I will present these results using several smaller correlation tables, broken down by interview and by variable. To foreshadow these findings, correlational analysis of the 36 narratives handwritten on the day after the *Challenger* event (the variables for the T1 narratives) yielded only one significant correlation greater than or equal to the minimum significant value of .325. In contrast, correlational analysis of the 40 memories at T2 and the 40 memories at T3 yielded 15 statistically significant correlations greater than or equal to the minimum significant value of .304.

The T1 narratives: Comparing students' T1 narratives to their later ratings of confidence (T2 and T3) and vividness (at T3) yielded only one significant relationship (see Table 9 below). There was an interesting negative relationship between pizzazz at T1 and confidence at T2 [$r(34) = -.339$, $p < .05$)]. In short, students whose day-after narratives contained the most pizzazz were the least confident of their memories 2.5 years later.

Table 9: Comparing narrative variables (T1) with self-report variables (T2 & T3).

T1 (N = 36)	**Confidence (T2)**	**Confidence (T3)**	**Visual (T3)**	**Auditory (T3)**	**Touch (T3)**	**Smell (T3)**	**Taste (T3)**	**Emotion (T3)**	**Thought (T3)**
Coherence	–0.129	–0.011	–0.131	0.050	–0.033	0.014	0.173	0.244	0.134
Orientation	–0.258	–0.132	–0.172	0.175	–0.236	–0.083	–0.133	–0.149	–0.263
Evaluation	–0.153	0.008	–0.270	0.057	–0.007	0.012	0.022	0.247	0.100
Pizzazz	**–0.339**	–0.110	–0.190	0.132	–0.126	0.090	–0.059	0.033	0.020
Word Count	–0.285	–0.236	–0.080	0.013	–0.151	–0.021	0.037	–0.166	–0.084

The T2 narratives: Comparing students' T2 narratives to their concurrent ratings of confidence (at T2) and later ratings of confidence and vividness (at T3) yielded 10 significant correlations (see Table 10 below). Six of the 10 significant correlations between the narratives at T2 and the self-report data concerned the variable pizzazz. Analysis revealed a strange series of relationships between pizzazz and confidence that crossed back and forth between interviews. First, students whose narratives contained the most pizzazz at T2, were the most confident of their memories six months later at T3 [$r(38) = .341$, $p < .05$)]. There are also several correlations between pizzazz at T2 and the self-reported vividness ratings given a few months later at T3. Students with the most interesting (pizzazz-filled) accounts at T2 reported later at T3 that they re-experienced more vividly the original sights [$r(38) = .326$, $p < .05$)], smells [$r(38) = .309$, $p < .05$)], tastes [$r(38) = .344$, $p < .05$)], emotions [$r(38) = .356$, $p < .05$)] and thoughts [$r(38) = .336$, $p < .05$)]. It is perhaps not surprising that students who report vivid recall across several sense modalities also write narratives with pizzazz at T2; more puzzling, however, was the that none of these vividness ratings at T3 correlated with levels of pizzazz at T3 (see Table 10).

Coherence at T2 correlated significantly with three of the self-ratings at T3. First, there was a strong relationship between coherent narratives and self-reported visual vividness. Students who had more coherent narratives at T2 reported at T3 that they held a very clear mental picture of the event in their minds [$r(38) = .445$, $p < .01$)]. There was also a relationship between coherent narratives and confidence ratings. Students with the most coherent narratives at T2 gave higher confidence ratings at T3 [$r(38) = .384$, $p < .02$)]. Finally, students who gave coherent narratives at T2 reported later at T3 that they could more vividly remember their thoughts at the moment they heard the news [$r(38) = .387$, $p < .02$)].

Table 10: Comparing narrative variables (T2) with self-report variables (T2 & T3).

T2 (N = 40)	**Confidence (T2)**	**Confidence (T3)**	**Visual (T3)**	**Auditory (T3)**	**Touch (T3)**	**Smell (T3)**	**Taste (T3)**	**Emotion (T3)**	**Thought** (T3)
Coherence	0.268	**0.384**	**0.445**	0.143	0.146	0.249	0.257	0.253	**0.387**
Orientation	0.247	0.141	0.179	0.117	–0.046	0.022	–0.179	0.135	0.299
Evaluation	0.225	0.224	0.074	0.137	–0.035	0.086	0.133	0.211	0.226
Pizzazz	0.224	**0.341**	**0.326**	0.251	–0.018	**0.309**	**0.344**	**0.356**	**0.336**
Word Count	0.125	0.239	0.213	0.144	0.005	**0.429**	0.182	0.217	0.214

Although word count significantly correlated with many of the narrative ratings (see Table 2 above) there was only one significant association between word count and the self-report ratings. The amount of words written in the narrative paragraph at T2 correlated with of self-reported olfactory vividness at T3 [$r(38) = .429$, $p < .01$)]. In other words, students who gave longer narratives at T2, gave higher marks to the question "to what extent do you re-experience the original odors you smelled at the time" when asked at T3.

The T3 narratives: Comparing students' T3 narratives with their earlier ratings of confidence (at T2) and their concurrent ratings of confidence and vividness (at T3) yielded five significant correlations (see Table 11 below).

Three of the significant correlations between the narratives at T3 and the self-report data concerned the variable coherence. First, there was an understandably strong relationship between coherent narratives and self-reported visual vividness. Students who gave more coherent narratives at T3 also reported that they held a very clear mental picture of the event in their minds at T3 [$r(38) = .618$, $p < .01$)]. In addition, students with the most coherent narratives at T3 gave higher confidence ratings at T3 [$r(38) = .458$, $p < .01$)] and at T2 [$r(38) = .352$, $p < .05$)].

There was also a significant association between confidence at T3 and evaluation at T3 [$r(38) = .343$, $p < .05$)]. Students who were more confident about their memories at T3 gave verbal narratives at T3 that included more emotional details about the event. Finally, there was a significant association across interviews between pizzazz at T3 and confidence at T2. Students whose narratives had more pizzazz at T3 were those who'd been most confident of their memories six months earlier (at T2) [$r(38) = .376$, $p < .02$)].

Table 11: Comparing narrative variables (T3) with self-report variables (T2 & T3).

T3 (N = 40)	**Confidence (T2)**	**Confidence (T3)**	**Visual (T3)**	**Auditory (T3)**	**Touch (T3)**	**Smell (T3)**	**Taste (T3)**	**Emotion (T3)**	**Thought (T3)**
Coherence	**0.352**	**0.458**	**0.618**	0.144	0.144	–0.077	0.217	0.190	0.295
Orientation	0.156	0.232	0.269	–0.115	0.035	0.014	0.031	0.138	0.097
Evaluation	0.150	**0.343**	0.279	0.208	–0.090	0.005	0.043	0.273	0.129
Pizzazz	**0.376**	0.248	0.251	0.217	0.023	0.010	0.100	0.181	0.254
Word Count	–0.213	–0.238	–0.009	–0.205	–0.214	0.041	0.045	–0.189	–0.162

In summary, the relationship between the narrative variables and the self-report variables often crosses across interviews. For example, students who wrote coherent narratives at T2, (and those who wrote narratives with more pizzazz at T2), six months later expressed more confidence in their T3 narratives and gave higher ratings to their ability to re-experience the original visual images. Similarly, students who wrote narratives with more pizzazz at T2 six months later gave higher ratings to their ability to re-experience the same smells, tastes, emotions and thoughts. And at T3 the relationship continues between those who told highly coherent stories and their self-reported confidence and visual vividness.

Relating narrative coding to accuracy and consistency.

In the original *Challenger* study (Harsch & Neisser, 1992) the students' day-after reports were considered to be the most accurate account of how they heard the news. Memories given 2.5 and 3 years after the event were compared with the day after report and a Weighted Attributes Score (WAS) was assigned. The WAS scores comparing T2/T1 and T3/T1 were called accuracy scores, and the WAS scores comparing T3/T2 were called consistency scores. Correlation coefficients were computed to compare these accuracy and consistency scores to the narrative variables at each three time periods and the results are presented in Table 12 (below).

Table 12: Comparing narrative variables with accuracy and consistency scores.

	T2/T1 Accuracy	T3/T1 Accuracy	T3/T2 Consistency
T1 (N = 36)			
Coherence	0.006	–0.053	–0.137
Orientation	–0.070	–0.043	–0.149
Evaluation	0.005	–0.070	–0.113
Pizzazz	0.045	0.020	–0.157
Word Count	0.029	0.018	–0.045
T2 (N = 40)			
Coherence	0.083	0.070	0.263
Orientation	0.263	**0.371**	**0.490**
Evaluation	0.053	0.043	0.069
Pizzazz	0.183	0.110	0.167
Word Count	0.038	0.057	0.211
T3 (N = 40)			
Coherence	0.220	0.234	**0.336**
Orientation	0.221	0.251	**0.455**
Evaluation	0.159	0.206	0.062
Pizzazz	**0.319**	**0.309**	0.236
Word Count	–0.072	–0.028	0.002

The T1 narratives. None of the narrative variables at T1 correlated with any of the accuracy or consistency scores.

The T2 narratives. For the written narratives at T2, orientation was the only narrative variable that correlated with accuracy and consistency. Students whose narratives (at T2) contained more orienting information (details that helped set the scene), had higher WAS T3/T1consistency scores [$r(38) = .490$, $p < .01$)] and higher WAS T3/T1 accuracy scores [$r(38) = .371$, $p < .02$)].

The T3 narratives. For the verbal narratives at T3, consistency correlated with the narrative measures of coherence and orientation, while accuracy correlated with pizzazz. Specifically, those students whose memories of the event were more consistent over time (WAS-T3/T2) also gave more coherent verbal narratives [$r(38) = .336$, $p < .05$)] and more orienting verbal narratives [$r(38) = .455$, $p < .01$)]. There was also a relationship between both of the WAS measures of accuracy and pizzazz in the verbal interview (T3). Students who told the most interesting (pizzazz filled) stories at T3 had higher accuracy ratings when comparing T3/T1 [$r(38) = .309$, $p < .05$)] and when comparing T2/T1 [$r(38) = .319$, $p < .05$)].

In summary, it appears that the *Challenger* memories that were most consistent between T2 and T3 were those narratives that contained higher levels of orienting details. And the narratives that contained the most pizzazz at T3 were also more accurate.

Metamemory Content:

At the end of the verbal interview (T3), students were shown their original handwritten questionnaires and given the chance to explain what they thought accounted for any differences they noticed. Later examination of the transcripts yielded six different types of explanations commonly offered by students (see Table 13 below). All students, even those who had received the highest accuracy scores and the least differences, offered at least one explanation for differences or omissions they spotted. Two students mentioned all six different types of explanation in their discussion. However, it should be noted that the results only reflect whether

each student gave a particular explanation, not how many times the explanation was actually given. For example, one student first reported she pictured a different informant, and then that she pictured a different TV room and later that she pictured the expression on her friend's face. Students who repeated the same explanation several times (as in this case with visual image) were simply given one credit for having used the particular category. So a student could have stated many times that different parts of the memory didn't match his or her current visual image, but receive only one yes in the category of visual image. Even so, the average number of categories used per student was 3.73 and the total number of categories used (summing up explanations for every student) was 149. (Again, see Appendices H & I for excerpts of student interviews showing how we coded their explanations and metamemory content.)

Table 13: Student explanations of differences in their memories between T3 and T1.

Explanation given:	% Students (out of 40)	% Response (out of 149)
I made an error when I wrote it down on the day after the event which I've since corrected	15%	4%
I simply forgot or omitted unimportant details	65%	18%
My current memory matches my visual image	82.5%	22%
My current memory matches what I know to be true	90%	24%
I tuned in to two different time slices, both happened.	62.5%	17%
Logically, my handwritten, day-after account can't be denied, but I just don't remember it that way.	57.5%	15%

The most common explanation given by 90% of the students was that their current memories matched what they knew to be true, based on their basic knowledge of what they usually did, who they usually talked to and where they usually kept particular items, and so on. For example, one student whose memory for the location had changed from a stairwell to outside explained why outside was the more truthy place to meet an informant: "Hmmm, I mean, 'cause

when you're walking up the stairs, I mean, in our dorm, it's like you don't really stop to talk to people. But, when you're outside, you seem to talk to people more, so I imagined that that was...someone was leaving the dorm as I was coming in...and they told me."

Another common explanation (given by 82% of the students) was that their current memories matched a visual image of the event that they pictured clearly in their minds. For example, a student who remembered she had heard the news while driving home read the hand-written (T1) account that said she had instead been driving to school and explained: "Because it goes against all that I have, you know, pictured and all of the uh, images that I have in my mind right now. Because it would be a totally different direction, and I just remember the setting that I was going through—it's same road—and the direction I was going in. Uhm. I somehow still seem to believe that I was going home."

Also common was for students (65%) to dismiss small differences they spotted as simply being unimportant details that were understandably omitted or forgotten. One student explained "…there's just little things…little details weren't as important as the actual event." Another student who originally heard the news on the radio, but later came to believe she'd heard it on TV said, "Uh, I think I just forgot hearing it on the radio or whatever because that seemed, not as big of a deal."

A number of students (62.5%) explained that their two differing accounts were both accurate, but simply described different slices of time surrounding the event. In other words the students explained that the error was technically a sampling error, rather than a memory error. In other words, at T3 a student reports a time when hearing the news, though not actually the first time. For example, a student who heard the news in his dorm and later came to believe he had heard the news while at home watching TV with his brother explained this theory of wrong time slice and also includes information about what was usual and truthy:

> "Uhm. The only thing I can say is I guess that was probably the first time I heard it and then, uhm, sometime later on... I guess if I did this... (flips

> questionnaire over and reads) January 29th. Uhm.... I'm trying to think when the period would have been when I saw it with my brother. He was still in High School, so he would have been home all the time, so it would have been anytime that I...I used to go home. I live here in Atlanta, so I used to go home like, all the time, even during the week, when I was here my freshman year. So it's likely that I could have been home the next day even. I don't know. Yeah, if it was Friday...yeah...if it was Friday, then it's likely that I probably saw the same thing the next day with my brother at home on the weekend."

Over half of the students (57.5%) candidly wrestled with the logic that their handwritten accounts from the day after must be correct, even when they had no current memory of events happening as originally written. For example, a student whose FBM accounts had changed over time kept looking at the hand-written questionnaire for the date of the questionnaire:

> "It says yesterday, so for sure that account was true… Though, it doesn't seem right or wrong. I'm for sure that's the way it happened and it seems funny that I can't remember that now…but…."

Finally, 15% of the students explained that they must have made a mistake when writing about the event on the day after it happened. In essence these students reject their original day-after record. For example, one student remembered he had been watching the launch live, though his hand-written T1 account indicated he'd slept through the launch and only learned the news from his roommate later. The student explained, "I just remember actually...I guess I just didn't fill this (T1) out sincerely. 'Cause I remember just coming in and being rushed to do it and we were supposed to fill it out as fast as we could."

To sum up, most students gave many diverse reasons for the differences spotted in their memories. The most common explanations given concerned whether the memory matched the student's self-knowledge and whether the memory matched the student's visual image of the event.

Expressing Surprise

At the end of the verbal interview (T3), when students were shown their original handwritten questionnaires, students often expressed surprise at the differences in the details of their memories over time. Half of the students (N = 20) expressed maximum surprise, 9 expressed moderate surprise and 11 expressed little or no surprise at the differences in their responses between T3 and T1. Those who expressed little or no surprise included students who spotted few differences between their (essentially correct) memories as well as students who spotted many differences in their memories, but had previously self-rated their confidence level as being low. Table 14 (below) shows the means (and standard deviations) for the measure of surprise (on a scale of 0–2). Although there is a slight gender difference, it was not statistically significant [$t(38) = .928$, *n.s.*].

Table 14: Means (standard deviations) for surprise during the oral interview (T3).

	Combined N = 36	Female N = 23	Male N = 13
	Mean (SD)	Mean (SD)	Mean (SD)
Surprise T3	1.19 (0.89)	1.26 (0.92)	1.08 (0.86)

When the ratings of surprise (at T3) were compared with the self-reported vividness ratings (at T3), it revealed an interesting inverse relationship between visual vividness and surprise. Students who reported at the beginning of the interview (T3) that they held the most vivid visual image of the event in their minds expressed the least surprise (at T3) over the changes in their narratives [$r(38) = –.307$, $p < .05$)].

Table 15: Comparing surprise (T3) with self-report variables (T2 & T3).

T3 (N = 40)	**Confidence (T2)**	**Confidence (T3)**	**Visual (T3)**	**Auditory** (T3)	**Touch (T3)**	**Smell (T3)**	**Taste (T3)**	**Emotion (T3)**	**Thought** (T3)
Surprise	–0.069	0.001	**–0.307**	–0.109	0.062	–0.235	–0.080	–0.125	–0.110

As might be expected, there was a strong negative correlation when comparing surprise with accuracy scores between T2/T1 [$r(38) = –.582$, $p<.01$)] and accuracy scores between T3/T1 [$r(38) = –.552$, $p<.01$)]. In other words, the students whose stories had changed more over time expressed more surprise.

Table 16: Comparing surprise (T3) with accuracy and consistency scores.

	T2/T1 Accuracy	T3/T1 Accuracy	T3/T2 Consistency
Surprise	**–0.582**	**–0.552**	–0.251

Interestingly, the 11 students who did not express much surprise at the differences between their T3 and T1 responses gave explanations in roughly as many categories per student ($M = 3.7$) as those 9 students who expressed moderate surprise ($M = 3.65$) and as those 20 students who expressed the most surprise ($M = 3.9$). So even the students that were less surprised offered many reasons why their memories differed over time.

Table 17: Explanations given by students with differing levels of surprise.

	Made T1 error	Just Forgot	Matches Visually	Seems Truthy	Time Slice	Can't deny T1	TOTAL
Surprise 0	2	9	8	10	5	7	41
Surprise 1	1	7	7	9	5	6	35
Surprise 2	3	10	18	17	15	10	73

To sum up, roughly three-quarters of the students expressed moderate or higher levels of surprise at the differences in their memories, even though when it came to explaining the differences, students at all levels of surprise used roughly the same number of reasons. Students who expressed the least surprise tended to be have the most accurate memories and self-reported having the strongest visual images.

Discussion

An overarching goal of this study was to examine FBM from a new functionalist perspective that addressed, not whether FBMs are special because of intrinsic qualities such as accuracy and longevity, but whether FBMs are special because of how they function for the individuals that hold them. Previous research suggested that FBMs may be no more accurate nor long-lasting than ordinary autobiographical memories (Christianson, 1989; Harsch & Neisser, 1989; Neisser & Harsch, 1992; Winningham, Hyman, & Dinnel, 2000; Talarico & Rubin, 2009). Yet there remains a widespread and entrenched idea that FBMs are a special type of memory. For example, there is wide agreement that FBMs are especially vivid and engender high confidence (Talarico & Rubin, 2009). This paper seeks to present a first window into understanding why people confidently hold these vivid but often inaccurate FBMs and postulates that perhaps it is because there is some way in which FBMs make particularly good narratives.

To investigate the question of FBM goodness from a functional perspective, I proposed three hypotheses to explain why details of the narratives changed over time in becoming less accurate. Each of the three hypotheses approached the definition of FBM goodness from a unique new perspective. The first hypothesis addressed a more objective definition of goodness, as defined by established narrative structural analysis and the narrative dimensions of coherence, orientation, and evaluation. Hypothesis two addressed a more subjective perspective of goodness as judged by the reader of (or the receiver of) a shared

FBM; it defined goodness using story-telling directives that suggest that the best tales contain pizzazz, in order to make the tale interesting to an audience. Hypothesis three addressed goodness from the subjective perspective of the narrator, (making use of students' metamemory comments). Hypothesis three was based on established literary (autobiography) and eyewitness testimony critiques (c.f. John Dean) which state that narrative details do not need to be strictly accurate, so long as they remain truthy to what individuals know about the gist of their experience. The data relevant to each of these three objectives are reviewed below with the following organization: 1) I will first discuss what an investigation of the narratives reveals about the judgment of FBM goodness both from structural and audience points of view, keeping in mind the limitations of the present study; and 2) I will discuss what analysis of the metamemory comments reveal about FBM goodness from the narrator's point of view, keeping in mind the benefits of this unique data set.

Coding the narratives:

In general, the results show that students provided *Challenger* narratives that were structurally good across all three interviews. Specifically, students told stories that were quite coherent and reasonably well oriented at all times. However, in the third interview (T3), which was a verbal interview, ratings for evaluation and pizzazz decreased significantly, especially when word count was used as a covariate. The change in interview format confounds the results, making it is impossible to determine for certain whether the decreases found in this study are a function of time, or of written versus verbal modalities, or both.

Further, no previous studies have compared differences between written and verbal autobiographical narratives over time. However, two studies that compared concurrent written and verbal narratives both indicate that the differences in narrative variables (except for word count) are negligible. In one study, 25 English-speaking college students were asked to provide written and then oral personal narratives describing "a favorite or most memorable summer"

(Smith, Heuerman, Wilson & Proctor, 2003); the written and oral narratives did not differ significantly when rated for coherence. As for narrative length, the students produced slightly more communication units (independent clauses) when speaking than when writing, but the difference was not significant. Similarly, in a Swedish study of aphasia patients that included a control group of ten university students, participants were asked to write and then tell a story on the topic "I have never been so afraid" (Behrns, Wengelin, Broberg & Hartelius, 2009). The control group of students included significantly more words in their spoken than in their written narratives, but there were no differences between modalities on ratings of whether the stories were 1) easy/difficult to understand, 2) not interesting/interesting, or 3) good/bad. The results are similar to the results from the *Challenger* students in that spoken autobiographical narratives are about twice as long, but no less coherent than written narratives. However, unlike the present study, which found that verbal narratives were rated lower on pizzazz, the Swedish study did not find any differences between written and verbal narratives when rated for "interestingness." It is not known how pizzazz ratings compare with the Swedish study's "interesting" ratings, but they both seem to involve a global judgment from an audience perspective. Unfortunately, the Swedish study also did not include any evaluative measures in their coding. Even so, these two studies lend some support to the validity of comparisons made in the present study across written and verbal FBM narratives.

Actually, the change in interview format (from written to verbal) was not an intentional research design of the present narrative study, but was instead a byproduct of the archival memory study from which the *Challenger* narratives came. To study FBM, one can either use such an archival data set to explore new FBM questions or wait, like an ambulance chaser, for a national tragedy and then rush to the scene with FBM questionnaires. Of course, as discussed in the introduction, a large problem with waiting for a new FBM event to occur, besides the obvious unpredictable delay in the start of the research, is that not all FBM events are created equal. Not all national tragedies (that at the time seem hugely important) engender FBMs suitable for follow-

up questionnaires two or more years down the road. Though it has since faded in importance, the *Challenger* disaster has already proved its FBM-worthiness as it has stayed in the national consciousness longer than most commonly researched FBM events, such as regional hurricanes and earthquakes. So if one wishes to analyze how FBMs function as narratives, and one wants to avoid the problem that an event when judged from dozen years down the line will no longer be seen as a flashbulb-worthy event, this study has shown that analyzing in a new way old data from an established archival data set may be a reasonable option. In fact, there may be additional archival memory studies, (e.g., FBMs of the 9/11 attacks) which contain narratives that could be re-analyzed in a similar manner to this study, from a functional perspective.

In spite of the fact that the original study was a memory study, not designed to solicit narratives for analysis, it did indeed prove possible to test the three narrative hypotheses and identify some interesting patterns. In fact, the results of the present study indicate that both hypotheses 1 and 2 were not supported. The narratives did not improve over time in ways that made them structurally better or in ways that gave them more pizzazz over time. A more specific summary of the results for the individual narrative variables follows.

Coherence. Perhaps it is not too surprising that the narratives did not become more coherent over time. Coherence scores, while not at ceiling, were consistently high across interviews. Thus, it is safe to assume that college students, even on the day after an event, come to the task with an already established narrative-telling ability; they know how to relate FBM events chronologically and how to add details that could be considered the point of the story. Even so, the fact that their scores weren't at ceiling on this measure of coherence is interesting. Perhaps some students understood correctly that the demand characteristics of the original memory experiment were to relate factual details, and not necessarily to make those details into the most share-able tales. In fact, on the first written interview, four students skipped the narrative section altogether and simply answered the follow-up questions, which indicates that

they, and perhaps others, may not have been in a narrative-creating mode but rather in a facts-relating mode. It would be interesting and instructive to conduct a follow-up study of FBM using a design specifically crafted to elicit FBM narratives. In fact, Brewer's (1992) criticism that early studies of FBM were not created with a test-retest paradigm appropriate for investigating the copy theory of memory, may point the way to archival studies that prove perfectly appropriate for investigating the narrative function of FBMs.

Orientation. As with Coherence, students' narratives did not change over time with respect to the kind of orienting details that help set the scene in a good narrative. In fact, students averaged only moderately orienting narratives across all three interviews. Again, the fact that students were not at ceiling on this measure suggests they may not have believed the task of the interview was to paint a word picture of the event, which would entail adding orienting comments. In addition, while there may be some events for which a thorough description of the setting adds very important details for the listener. It is possible that for an FBM situation in general, a shorthand description of "I was in my room…" will suffice so that the narrator can then focus the brunt of the narrative on the more important details of what happened in that room. Similarly, in a FBM study conducted in a university setting, students may assume a shared common knowledge of the university environment when they give their narratives to an experimenter from that university, such that the statement "I had just returned to my room after class" might be assumed to be all the description needed to convey a dorm room setting.

Evaluation. In the six months between the second written questionnaire (T2) and the verbal third interview (T3), students' narratives, when adjusted for word count, appeared to lose some of the evaluative details, especially those that characterized the emotional weight of the event. One explanation for this finding is that, by the third interview, which was three years after the event, much of the emotion they felt concerning the *Challenger* disaster had become blunted

with time. In fact, Bartlett (1932/1995) suggested that that "…when a subject is being asked to remember, very often the first thing that emerges is something of the nature of attitude. The recall is then a construction, made largely on the basis of this attitude and its general effect is that of a justification of the attitude" (pp. 206–207). Thus, it is possible that students at T3 felt a blunting of emotion, due to the passage of time, and then they assumed, when reconstructing how they felt at T1, "that their current attitudes are accurate representations of their past opinions" (Ross & Newby-Clark, 1998, p. 134) and gave a lower estimate of their emotional experience, or left it out altogether. Even so, such a significant change between T2 and T3 seems unlikely, given that only 6 months separated T2 and T3.

Another possibility is that the lessening of evaluative comments in the T3 narrative had to do with the non-verbal social sharing possibilities present in the verbal interview format but not in the written format. For example, relating their FBM narratives verbally to an experimenter may have allowed students to communicate some of their emotion with intonation and gestures that precluded the need for additional word details. Simply writing "I was shocked" may require further clarification at T2, leading to a higher evaluative score, whereas it may be possible to gesture with palms up, a raise of one's eyebrows or even added stress on the word shocked, when responding in person, in a way that conveys the felt emotion with less need for evaluative words. Future research examining verbal narratives of FBMs may wish to include examination of non-verbal communication, particularly of the emotional aspects of the memory.

Pizzazz. One surprising result is that the verbal interviews contained significantly less pizzazz, even though the narratives contained about twice as many words. In their discussion of what makes a interesting story, Baron and Bluck (2009) suggest that, in order to tell a good personal story, it is important to give details that stay on target with the main point of the story. They advise that the only reason a good story should ever veer off the main point would be to provide important background information that would add an interesting detail to the overall

narrative. For example, the basic narrative below is of a girl standing in her dorm room when her roommate comes in and tells her of the crash, at which point she leaves to inform a different girlfriend.

> "Ok. I believe I was standing, you know, in the middle of my room, pretty much. We had this mirror and I was probably fiddling with my hair or doing something. Uh, my friend, Alice... No, I think it... No, it was Alyssa, my roommate, came in and told me about it, you know, that it had crashed. And then I went and I told my friend Alice."

This narrative above was judged as being moderately interesting for the aside, "We had this mirror and I was probably fiddling with my hair," which adds, as Baron and Bluck suggest, an additional orientating detail that helps the listener better visualize the scene. However, this narrative also contains several extraneous comments (e.g. Ok. Uhm, let's see) and repetitions, (e.g. "my friend, Alice…no, I think it...no, it was Alyssa…"), which add words to the narrative without adding pizzazz or substance. Adding superfluous words to the narrative detracts from what Smith et al. (2003) call narrative efficiency, which is basically a measure of number words per new detail given. Narratives that are inefficient force the audience to work harder to sort out the important details—an activity which detracts from audience enjoyment and overall judgments of pizzazz. In contrast to verbal narratives, written narratives are usually under much less time pressure than oral narratives (Burns et al., 2009), giving the writer more time to make edits, which leads to higher efficiency, which might lead to higher pizzazz scores.

But perhaps what contributes most to the lower pizzazz scores at T3 is the link between evaluation and pizzazz, such that narratives with fewer evaluative comments were also those judged as being less interesting. Again, as an example there is the verbal narrative from the T3 interview with the girl fiddling with her hair in front of the mirror, which contains no evaluative statements and a received a mid-level pizzazz score.

Finally, conventional wisdom often allows that some people are natural-born story-tellers, consistently relating their stories with more pizzazz than others. In fact, Bruner (1987) credits Henry James with observing that "stories happen to people who know how to tell them" (p. 11). Thus, it was considered possible that a group of natural FBM story-tellers might emerge who knew how to tell more interesting FBM stories across all times. However, pizzazz scores across time did not significantly correlate with each other. Thus, it does not appear that there is one group of students who consistently tell interesting FBM narratives, but rather that students tell differentially pizzazzy stories over time.

Coding the metamemory comments.

Although it comprises a relatively small segment of the analyses, perhaps the most fascinating aspect of the present research concerns the metamemory comments made by the students at the end of the verbal interview (T3). By asking students to reconcile the differences between how they believe they originally heard the news and how the T1 questionnaire reports that they actually heard the news, we were given a rare peek into what these participants think about the changes and errors in their memories. To my knowledge, there is no other research study in which participants are given a chance to reconcile the differences between their current memories and a hand-written account from years earlier that most participants have forgotten. As previously stated, the fact that the original T1 accounts were written within 24 hours of the *Challenger* event allowed most students to eventually conclude that their day-after questionnaires gave an accurate account of the event; this allowed students to consider any differences that occurred over time as inaccuracies. Even so, most of these participants stated they preferred their currently held (though inaccurate) memory of the event to their day-after memory—again suggesting how invested many were in their current version of the details of hearing the news. In fact, out of 40 students, most expressed either moderate (N = 9) or high levels (N = 20) of surprise that their memories had changed over time. Similar to what Barclay (1986) observed

about truthfulness in literary autobiography, authors of autobiographical tales often think the information reported is accurate, but upon careful analysis may be surprised to find it is not (p. 85). Analysis of these students' memory failures and metamemory comments contributes to our understanding of FBM as well as constructive memory processes in general.

The methodology in this part of the interview is relatively unique in the literature. Thus, it's important to again emphasize the fact that, as the one who conducted all the student interviews, I had never previously viewed any of the original hand-written transcripts before that moment when one was taken from a manila envelope and placed in front of the student. Although I was familiar with transcripts from T1 that were collected from some of the original 106 students who had left Emory prior to our follow-up interviews, I was blind to the contents of the T1 questionnaires for all 44 students who participated in this study. Perhaps because neither interviewer nor student knew what the original questionnaire might say, or perhaps because students were given a unique opportunity to "catch up" on details of an event from their past, as written in their own handwriting, they often lingered over this last part of the interview for many minutes contemplating the differences. For example, one student who clearly realized there were many details that she no longer remembered gave the following narrative at T3:

> "Uh, I was a freshman and I think I heard it when I was in my dorm room. Um, I have no recall. I've been through this already—I have no recall of it. I remember afterwards, but not the moment I heard."

Even though she could have summarily dismissed many of her memory errors as details simply forgotten with time, she later spent what amounted to three typed pages, discussing how the original account didn't match what she now knew to be true. When I paused and said I was trying to think if there was another question I might ask her she exclaimed, "I'm happy to answer anything!" Another student whose memory had changed dramatically (from being in his dorm room with friends to being in his parents' basement with his brother), spent almost five typed pages discussing the changes in his memory over time and stated, "This is my way of

making a contribution to science. I know I'm not going to be a Nobel Prize winner, so…at least I can make my contribution in this small way." Although rare in the literature, this method of allowing students to reconcile the changes in their memories over time may prove to be a useful methodology for future studies that seek insight into how memories change over time.

The most common explanation given for the changes in memory (by 90% of the students), fell into the truthiness category—which stated that their current memories had changed in some way that better matched what they knew to be true about their lives at the time of the event. For example, one student's gist knowledge of where she usually ran into Annie, the cleaning lady, had caused her to alter the location in her memory of where she'd been when she'd heard the news. Originally she'd heard the news from the cleaning lady in the hall outside her room, but her general knowledge of where she usually talked to the cleaning lady caused her to shift locations from dorm hall to outside the dorm bathroom. When asked to explain, the student said:

> "I think I sort of said that because to go to this room from where I was going, I guess, I...for some reason I think that you have to walk by the bathroom...and that's how I always see Annie. That's how...I mean, I would always talk to her in the bathroom...so, I don't know...I guess I just sort of assumed that I walked past the bathroom."

So for this student, having a conversation with the cleaning lady outside the bathroom is more true to the gist of where conversations with the cleaning lady often took place. For another student, his gist knowledge of the fact that he usually got up early to go to class influenced him to shift his memory from having heard the news after 11, to having heard the news sometime between 8 and 9 A.M. When asked to explain he said:

> "I don't know. Probably because I didn't think I'd skip class. I didn't miss class much. But I know I had an earlier class than that. I probably... I wonder what day of the week that was…."

So for this student, his visual image of being in the shower getting ready for class combined with his gist knowledge that he had early classes that semester and that he wasn't the kind of person to skip class. For him it was more truthy to recall that the shuttle disaster happened several hours earlier while he was getting ready for class. As Barclay (1986) explains, "the past is reconstructed such that the person adds or takes away information to make a story coherent and believable to themselves and others at a particular time" (p. 86).

Remembering the little incidental details like time of day a student usually took a shower or the location where a student usually ran into the cleaning lady might be what Brown and Kulik called "utterly idiosyncratic and, in a sense, accidental content" (1977, p. 95). Still, for these students, it appears that the idiosyncratic content is the most important part of their FBMs. These students' responses indicate time and time again that they prefer their T3 memories because of the truthy and idiosyncratic details they contain. In fact, the memory details were so preferred that when a handwritten narrative from T1 suggested that truthy memories may be inaccurate, six students went so far as to suggest that their original hand-written, day-after narratives (T1) might be the source of the inaccuracy. For example, one student who was surprised "that it's so different" was asked what she noticed that was so different. She replied: "Uh…pretty much everything. Probably I didn't care when I was taking this." And later she adds, "Maybe I just was…I just wanted to fill it out and get out of class." In other words, she so prefers her current truthy version that she discredits the original questionnaire.

In analyzing the metamemory comments, it was surprising that so many students made use of so many different types of explanations during the course of their discussions. For example, it was initially considered that the group of students who had given the strongest visual vividness ratings might also rely almost exclusively on the visual explanation in their discussion and less on their knowledge of their milieu. In fact, in the initial memory study, high visual vividness ratings on T3 correlated with consistent memories from T2 to T3, indicating there was a group of students with consistent and visually vivid challenger memories. However, it appears

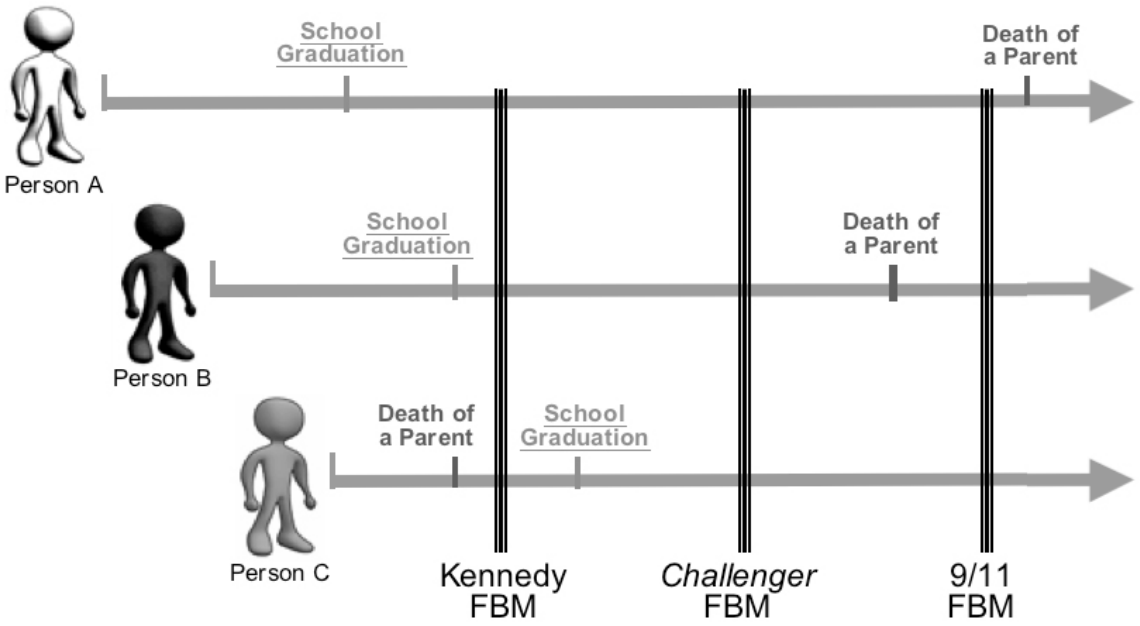
that even those who report that their visual image of the event is less vivid may nonetheless reference it as they try to understand the changes in their memories over time. A large group of students, (about 82%), at some point explained that they referenced a mental image when explaining how they decided what was a real memory of how they had heard the news. Although, it may be that the students with the more vivid visual images referenced them many more times during their explanation of differences, than did those students with less vivid visual images, but our method of coding was not sensitive enough to catch such a distinction.

In summary, explanations that the subjects gave to explain the changes in their memories most often concerned what they knew to be true about the gist of their lives. Unusual locations, informants who were never around, ongoing activities that rarely happened and times that didn't match up with a student's usual schedule, were often dropped from the memory and replaced with details more true to the gist of each student's experience of their second semester Freshman year at Emory. Thus, this data supports Hypothesis 3, that the stories became more truthy over time.

How FBMs are special

In order to understand why students often prefer their truthy FBMs, it may help to compare how FBMs and other memories fit into the timeline of an individual's life. In fact, the most unique aspect of FBM may be the way it lines up a single moment (within a few hours or so) across the timelines of many different people. Everyone who shares the same cultural FBM event, shares the exact same benchmark in history. So if, for example, I am talking to my sister and my mother and my grandmother, all born in vastly different years, an FBM event allows us all to line up our lives at the exact same moment in history (see Figure 3 below). Thus, from a social bonding perspective, what's special about FBM may simply be the unique way it allows for life comparisons across a shared cultural moment.

Figure 3: How three different types of culturally shared memories might align across the life paths of three people born several years apart.



To understand how unique this is, one merely has to pick a date and ask, for example, the same family members (sister, mother, grandmother) to compare where they were on a specific day like January 28th, 1994. Most individuals have trouble quickly accessing a memory with such a retrieval cue. While it might be possible, after some ruminating, to come up with a regular autobiographical memory for that 1994 date, it is also conceivable that no specific memory will ever be found. However, one of the hallmarks of FBM memories is how much less time and effort is required to retrieve them. Thus, it is much easier to compare personal memories for a specific FBM date like January 28th, 1986, especially if phrased "Where were you when you heard the news the space shuttle *Challenger* exploded?" From the perspective of time and ease of retrieval, comparing FBM memories may be a rather efficient way of comparing autobiographical memories and contrasting individual life stories.

Thus, the FBM event may be special in that it allows people to quickly compare the idiosyncratic details of their lives on a particular date, without having to wait while each person

tries, and perhaps fails to figure out where they must have been on that day. So, for example, the grandmother may remember having been at home fixing breakfast for Grandpa, and the mother may remember having been grocery shopping and the sister may remember having been in a college bathroom talking to the cleaning lady. All of these memories paint different pictures of what each person's life was like on the same day in question. In fact, it may not be important, when using FBMs for social-sharing purposes, to relate a tale that is perfectly accurate. A truthy story that conveys the gist of the experience may be all that is required for the sake of comparison.

There are, of course, other types of shared cultural moments that line up individual memories, differently than FBM events. For example, there are transition events, like high school graduations, that line up individuals at the same point in their lives, (around age 18) regardless of when they were born. Unlike FBMs, these events do not share a common point in historical time, but rather a common point in lived time. And then there is the Brown and Kulik (1977) category of sundry private shocks, such as hearing the news of the death of a parent, in which common experiences do not line up in either historical time or even necessarily at the same stage in lived time. For sundry private shocks, and for other personal experiences, what is shared is the similarity of experience, regardless of time frame. With FBMs what is shared is similarity of time frame, regardless of experience.

Conclusions

At least as far back as Colgrove's (1899) investigation of memories for hearing the news that President Lincoln had been assassinated, there has been a feeling that these types of national reception events lead to a special type of memory. But in what way are these memories special? This paper investigated the possibility that FBM's make especially good stories for social-sharing purposes. However, my analyses of narrative structure and pizzazz did not support the conclusion that students' *Challenger* FBM narratives become structurally better or more

interesting stories over time. Instead, my analysis of the students' metamemory comments indicated that the memories may change over time to become more truthy stories. Truthiness is a quality that is recognized in literary autobiography as one way to efficiently characterize the feel of the person in the moment, with less concern for the accuracy of specific details. FBM narratives may turn out to be very much like literary autobiographies in the way they serve to characterize the truthiness an individual's experience at a historical point in time. And since historical FBMs line up many individuals' memories at that same exact moment, then perhaps the special importance of FBM lies somewhere in the efficient access it provides to culturally shared and sharable memories. Unfortunately, this analysis is limited by the use of an archival data set that originally focused on the accuracy of memory and not on narrative truthiness. It is my hope, in the future, to design a study of FBM with a streamlined narrative focus that will overcome some of the problematic issues associated with using an archival data set.

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Appendix A: The First *Challenger* Questionnaire (T1).

Ulric Neisser
Psychology Department
January 29, 1986

HOW DID YOU HEAR ABOUT THE EXPLOSION OF THE SPACE SHUTTLE?

Psychologists who conduct research on memory, especially memory for important life events, have often studied people's recollections of how they first heard some major piece of news. However, we have never had a baseline against which these data could be compared. What is needed is information about how a large number of randomly–chosen individuals first heard – and reacted to – the news of some such event. That is why we are asking for your cooperation today. If you are willing to help, please take a few minutes to answer the questions on this and the next page. Thank you.

Name_____

Age_____ Sex _____

Yesterday the Space Shuttle ***Challenger*** exploded shortly after takeoff, killing all seven aboard. Please describe how you first heard this news. Make your description as full and complete as you can.

PLEASE TURN OVER

Please answer the following questions explicitly. (If you have already provided the information on the previous page, just write "see other side.")

1. What time of day was it when you first heard the news?

2. How did you hear it (TV, Radio, someone told you, etc.)?

3. Where were you at the time?

4. What were you doing at the time?

5. Who told you? (If TV/Radio, what program; if person, who?)

6. Who else (if anyone) was present?

7. How did you feel about it? What was your first reaction?

8. How did the person who told you seem to feel about it?

9. How did the others present (if any) seem to feel about it?

10. What did you do immediately afterward?

11. Later in the day and evening, did you continue to talk about the event, or follow TV/radio coverage of it? About how much time (in total hours or half hours) did you spend in this way yesterday?

Appendix B: The Second *Challenger* Questionnaire, (T2)

SPACE SHUTTLE MEMORY STUDY

Name _____

Age _____ Sex _____ Date_____

Thank you for agreeing to participate in this study. Your participation is entirely voluntary and may be discontinued at any time. Everything you say will be held in strict confidence by the experimenters; if the results of the study are published, no individual responses will be identified.

This is a study of memory for unusual events. Our focus is on the tragic explosion of the space shuttle *CHALLENGER*, which occurred early in 1986. However we are not primarily interested in what you know about the explosion itself, i.e. in facts that were reported by the media or brought to light by subsequent investigations. Instead we are interested in the moment when you yourself first learned that the shuttle had exploded. In the space below, please describe how you first heard this news. Make your description as full and complete as you can.

Thank you. Please turn to the next page.

Shuttle Questionnaire, page 2
Name _____

Now that you have given a general account of how you heard the news, we would like you to answer a few more specific questions about it. Please answer each question explicitly. After answering it, please circle a number from 1 to 5 to indicate how much confidence you have in your memory on this particular point:
"1" - you are just guessing and don't really remember at all;
"5" - you are absolutely certain about it.

1. What time of day was it when you first heard the news?

Rating 1 2 3 4 5

2. How did you hear it (TV, Radio, someone told you, etc.)?

Rating 1 2 3 4 5

3. Where were you at the time?

Rating 1 2 3 4 5

4. What were you doing at the time?

Rating 1 2 3 4 5

5. Who told you? (If TV/Radio, what program; if person, who?)

Rating 1 2 3 4 5

6. Who else (if anyone) was present?

Rating 1 2 3 4 5

7. How did you feel about it?

Rating 1 2 3 4 5

8. How did the person who told you seem to feel about it?

Rating 1 2 3 4 5

9. How did the others present (if any) seem to feel about it?

Rating 1 2 3 4 5

10. What did you do immediately afterward?

Rating 1 2 3 4 5

(Please turn to the next page.)

Shuttle Questionnaire, page 3
Name _____

11. Later that day, and that evening, did you continue to talk about the event or follow TV/radio coverage of it? About how much time (in total hours or half hours) did you spend in this way on the day of the explosion?

Rating 1 2 3 4 5

12. Since the time of the explosion (i.e. in the approximately three years between then and now), how often have you thought about that moment when you first heard the news of it Check one:
___ never
___ hardly ever
___ a few times
___ often
___ very often.

Rating 1 2 3 4 5

13. The successful completion of a new space shuttle flight was extensively covered by the media this fall. Did that coverage tend to remind you of your own earlier experience, i.e. of hearing the news of the *CHALLENGER* explosion? (Note: we are sure that you must have been reminded of the *CHALLENGER* explosion itself; the question here is if you were reminded of the moment when you heard the news.)
___ no
___ once
___ a few times
___ often
___ very often

Rating 1 2 3 4 5

14. Have you ever previously filled out a questionnaire on this subject - i.e. on how you heard the news about the *CHALLENGER* explosion? If so, when did you fill it out?
___ no
___ yes, within a few days after the explosion
___ yes, sometime within the last three years
___ yes, recently (sometime this fall).

Rating 1 2 3 4 5

15. If you answered "yes" to the preceding question, please describe the circumstances under which you filled out the previous questionnaire.

Rating 1 2 3 4 5

Thank you very much for your help!

Appendix C: Notes used when conducting the 1989 verbal interview (T3).

Thank you for agreeing to participate in this study. Your participation is entirely voluntary and may be discontinued at any time. The interview is being tape recorded, but everything you say will be held in strict confidence. If the results of the study are published, no individual responses will be identified and no names will be used.

I. This is a study of memory for unusual events. Our focus is on the tragic explosion of the space shuttle *Challenger*, which occurred early in 1986. However, we are not primarily interested in what you know about the explosion itself, (i.e. the facts that were reported by the media or brought to light by subsequent investigations.) Instead, we are interested in the moment when you yourself first learned that the shuttle had exploded. If you could now please tell me how you FIRST heard this news. And please make your description as full and as complete as you can.

Is there anything else that you may have left out?

IIA. Now, I'm going to ask you several specific questions about your experience, right now, when you remember about hearing the news

FIRST, I would like you to rate your <u>OVERALL MEMORY</u> of the event using a 7–point scale where :

1= I have no memory at all of the time when I first heard the news.
7= I am certain that I remember the time when I first heard the news.

B. I'm also interested in knowing, when you think back on that time, how vivid is your experience now--as compared to what it was then. In a few seconds, I'm going to ask you to respond using a 7–point scale where 1 is at the low end of the scale (for example: As you think about it NOW, you have "no re-experiencing of the particular event") and 7 is the highest or strongest end of the scale (meaning as you think about it now, you have a complete re-experiencing of the particular event--almost as if you were there.)

Visual: Right now, when you think about the time that you heard the news about the *Challenger* explosion, to what extent do you re-experience (or see in your mind) the view that you originally saw.

1= I have no re-experiencing or picture of the original visual scene.
7= I have a complete re-experiencing or picture of my original visual scene.
(Can you tell me just what the view is that you're seeing in your mind)

Auditory: Right now, when you think about the time that you heard the news about the *Challenger* explosion, to what extent do you re-experience (or hear in your mind) the original sounds you heard at the time?

1= no re-experiencing of the original sounds.
7= complete re-experiencing of the original sounds.
(Can you tell me just what that sound is that you're re-hearing.)

Touch: Right now, when you remember hearing the news about the *Challenger* explosion, to what extent do you re-experience the feeling of the things you touched.

Smell: When you remember hearing the news about the *Challenger* explosion, to what extent do you re-experience the smells you originally smelled.

Taste: Right now, when you remember hearing about the *Challenger* explosion, to what extent do you re-experience the tastes you originally tasted.

Emotion: Right now, when you remember hearing the news about the *Challenger* explosion, to what extent do you re-experience the original feelings or emotions you felt at the time.

Thought: Right now, when you remember hearing the news about *Challenger*, to what extent do you re-experience the original thoughts that you were thinking.

III. COGNITIVE INTERVIEW: Now I'm going to try to jog your memory in various ways. After each new question, I'm going to ask you if there is anything else that you now remember about the time that you heard the news. It is very important that you report everything new that you can think of. Some people hold back information because they are not quite sure that the information is important. Please do not edit anything out of your report, even things you think may not be important. Nothing is too trivial.

1.) Try to reinstate in your mind the context surrounding you when you first heard about the shuttle. Tell me about what the surrounding environment looked like at the scene, such as rooms, the weather, the lighting, any smells and any nearby people or objects.

2.) Try to reinstate in your mind the emotions you felt when you first heard about the shuttle. Tell me about how you were feeling at the time. What were your reactions to the news?

3.) Try to recall the events in a different order. It is natural to go through the incident from beginning to end. However, you also should try to go through the events in reverse order. Or, try starting with the thing that impressed you the most about the incident and then go from there, going both forward in time and backward.

4.) Try to recall the incident from different perspectives that you may not have had, or adopt the perspectives of others who were present when you heard the news. For example, try to visualize yourself as an observer might see you and tell me about how you would appear to her.

At this point, do you recall any other details of hearing the news of the *Challenger* explosion that you may have left out of your original account?

5.) Now I would like you to go through your whole day. Try to think about what you were doing just before you heard the news. And what you were doing before that. What your day was like? What time did you get up that morning? What did you do all day? What happened next?

6.) Think of an alternate way that you might have heard the news. Knowing what you know about your life back then, I'd like you to tell me a different way that you might have heard the news. How is it different than what you said earlier?

7.) Think of how a friend of yours might have heard about the news. Tell me about what it was like for your friend. How is it different than how you yourself heard the news?

8.) Try to recall what January of your Freshman year was like. Did anything unusual happen during that time? How was the beginning of your Spring term Freshman year?

At this point, do you recall any other details of hearing the news of the *Challenger* explosion that you may have left out of your original account?

IV. COLLABORATIVE COMPARISON:

A.)Take out W2 and read through it together.
Do you remember filling out this one?
(What do you think about the differences between these two)

B.) Read prepared cue (based on differences between W2 and W1.)

C.) Tell them about the first interview (W1).
Do you remember filling out an interview the day after the shuttle exploded?

You actually did fill out a shuttle interview in Heilbrun's Personality Development class—toward the end of class.

D.) Take out W1 and read through it together.

Are there any differences that show up between interviews?

Did all of the mentioned events actually happen?
How do you know this event actually happened?
Do you think that all of the details are accurate?

What do you think caused the differences between the 2 interviews?
Could any of the events have really happened—just some other time?

Appendix D: All data from the two written questionnaires (T1 & T2) for Subject 16.

(Note: This presents the data in original format used for coding accuracy and consistency)

Time 1:

Yesterday after my ten o'clock class I went right back to my room. I turned on the radio and started cleaning the room. This is when I heard the news, almost right after it happened. I heard the news over and over again on the same station.

Time:	11:20 AM
How:	Radio
Where:	Room
Activity:	Cleaning the room
Informant:	Radio DJ 92 FM
Others:	no one
You feel:	I was very shocked that it happened & sad at the same time
Informant feels:	The DJ said it as if it was a big shock to him also
Others feel:	
Afterwards:	kept cleaning while I listened to the radio for more updates
Time spent:	30 minutes talking about it & watching Tv

Time 2:

It was on a Tues or Thurs because I was coming back to my dorm from my English class. Instead of going to my room, I went downstairs to visit someone and walked past the lounge where there were someone [sic] others watching television - this was the first time I had heard about it. I saw an instant replay of the explosion on the television. *I remember it very well because I'm from Orlando, FL.

		Confidence
Time:	between 11:30--12 noon	5
How:	Tv	5
Where:	in the lounge of my freshman hall	5
Activity:	coming back from class & saw people watching Tv	5
Informant:	Television	5
Others:	the others in the room talked about it	5
You feel:	It was unfortunate. I was shocked. I was sad for the families of the dead astronauts	5
Informant feels:	everyone in the room was shocked	5
Others feel:	Everyone in the room was shocked	5
Afterwards:	Went up to my room to put my things away & eat lunch	5
Time spent:	25 minutes	3
	Never filled out a previous questionnaire	5

Appendix E: Example narrative #116 and how it was coded.

(Note: This re-presents the narrative from Appendix C, (Time 1) for subject #16, reformatted for narrative coding, with an additional table showing the narrative codes it received.)

Code: 116

Yesterday after my ten o'clock class I went right back to my room. I turned on the radio and started cleaning the room. This is when I heard the news, almost right after it happened. I heard the news over and over again on the same station.

Coding variable	Code received
Coherence:	3 on a 5 point scale (1–5)
Orientation:	0 on a 3 point scale (0–2)
Evaluation:	0 on a 3 point scale (0–2)
Pizzazz:	1 on a 3 point scale (0–2)

Appendix F: Example narrative #89 and how it was coded.

(Note: This re-presents the narrative from Appendix C, (Time 2) for subject #16, reformatted for narrative coding, with an additional table showing the narrative codes it received.)

Code: 089

It was on a Tues or Thurs because I was coming back to my dorm from my English class. Instead of going to my room, I went downstairs to visit someone and walked past the lounge where there were someone [sic] others watching television - this was the first time I had heard about it. I saw an instant replay of the explosion on the television. *I remember it very well because I'm from Orlando, FL.

Coding variable	Code received
Coherence:	3 on a 5 point scale (1–5)
Orientation:	1 on a 3 point scale (0–2)
Evaluation:	0 on a 3 point scale (0–2)
Pizzazz:	2 on a 3 point scale (0–2)

Appendix G: Example narrative #112 and how it was coded.

(Note: This is the narrative from the 1989 verbal interview (T3) for Subject #16 as formatted for narrative coding, with an additional table showing the narrative codes it received.)

Code: 112

Ok. Uhm. It was, I guess maybe 11:30. I was coming back from my 10 o'clock English class and I was walking down the hall and I saw people watching Tv in the lounge in my dorm, 'cause this was Freshman year. And I was like, "What are you guys looking at? What's going on?" And everyone was like in a trance--looking at the Tv. And as I'm walking in, they showed a picture of the explosion and that's when I saw it.

Before I saw it...it was in a dorm Tv lounge, and there were other people around. And everyone was watching it, and I walked in, it was like, you know nothing that I'd expected-- I knew it was going up. And uhm...it was a nice day. It was sunny...it was really pretty outside. And, I don't know. That's it

Coding variable	Code received
Coherence:	4 on a 5 point scale (1–5)
Orientation:	2 on a 3 point scale (0–2)
Evaluation:	1 on a 3 point scale (0–2)
Pizzazz:	1 on a 3 point scale (0–2)

Appendix H: Example narrative #98 and how it was coded.

(Note: This is a narrative (from a different student than in the previous appendices) as an example of the type of narrative that received maximum scores on all the narrative coding variables.)

Code: 098

I was in my friend Sonal's room around noontime when I had a break between class and work for lunch. The door was open and the cleaning lady (Annie) walked by and said something about an explosion. I didn't really understand her, but when I left to go back to my room I passed a couple of my friends watching TV in their dorm and on the screen was the whole story. I was shocked. I felt like crying. I live about an hour or two away from Cape Canaveral and I can usually see the Space Shuttle go up from my house. To think about the unexpectedness and tragedy just kind of put a damper on my whole day.

Coding variable	Code received
Coherence:	5 on a 5 point scale (1–5)
Orientation:	2 on a 3 point scale (0–2)
Evaluation:	2 on a 3 point scale (0–2)
Pizzazz:	2 on a 3 point scale (0–2)

Appendix I: Interview 112 and how metamemory explanations were coded.

(Note: This presents the metamemory explanations given at the end of the 1989 verbal interview (T3) by Subject #16 whose narratives have appeared previously in Appendices D, E, F and G.)

PARTICIPANT 16—INTERVIEW CODE 112

The transcript below was coded as having had one or more of the following explanations given by the student at some point during the transcript.

Category	Description
Logical omission	I simply forgot or omitted unimportant details. It's no big deal.
Self-knowledge:	Subject searches self-knowledge and offers a truthy detail known now (at T3) about life and the general milieu back then.
Visual Image:	T1 doesn't match the visual image I now see in my mind at T3.
Timeslice:	Both versions (T1 and T3) actually happened at different times.
Can't deny the evidence	Logically, my handwritten, day-after account (T1) must be accurate, but I still just don't remember it happening that way.

4c. After the questionnaire from T1 is placed on the table

STUDENT: This was freshman....this was right after the explosion?

Interviewer *I guess so.*

STUDENT: 'Cause I had the class freshman year. (Pause) Oh my God! On the radio?

Interviewer: *What do you think? Do you think it...?*

STUDENT: Was it really...Was this really the day before? The day after?

Interviewer*: Uh-huh.*

STUDENT: Oh my God!

Interviewer: *(laughs) (pause) What do you think?*

STUDENT: I don't know. This is weird. On the radio??

Interviewer: *Do you think that that could have happened? I mean does it sound right?*

STUDENT: No! I just remember seeing it in the lounge. I don't know why I put on the radio, if this was the day after.

Interviewer: *Uh-huh. Uh-huh. Uh-huh.*

STUDENT: I remember that was how it happened. But if this was the day after….

Interviewer: *Uh-huh. Uh-huh. Hmm. If you didn't have this to go on.... I mean, if you didn't know... You know? If you didn't see...?*

STUDENT: I would have been convinced that it was the way that I told you. (pause) Was this really the day after?

Interviewer: *Uh-huh.*

STUDENT: Oh my God!!

Interviewer: *Now that you see this does this jog your memory? Do you remember it at all…*

STUDENT: (interrupting) ..No....

Interviewer: *...like this?*

STUDENT: ...No.

Interviewer: *Do you think it's possible that it could have happened like this?*

STUDENT: It could be. Maybe I went down. Maybe I hear it upstairs and then went downstairs...and saw it on the Tv. And I just remember, maybe, seeing it on the Tv more vividly than hearing it on the radio.

Interviewer: *Uh-huh.*

STUDENT: Oh my gosh, this is really bizarre. I don't know.

Interviewer: (*Turn to page 2) (Long pause while reading together.) Do you see any differences here? Anything that sticks out?*

STUDENT: I don't even remember being in my room, cleaning my room and hearing it on the radio.

Interviewer: *Uh-huh. Uh-huh. Why do you think that is?*

STUDENT: I don't know?

[There is a knock on the door. Interviewer says, "yes?" Voice asks, "Is Ira here?" Interviewer says, "No he's not." Voice says, "Ok, thanks."]

STUDENT: (pause) Like I barely even remember filling this out.

Interviewer: *Uh-huh. Let's see. Before we were interrupted by the knock, what did you start to say? Let's see, I asked you where do you think this memory went. Or what do you think you think happened, or why do you think…*

STUDENT: (Laughs) I don't know! This so strange. I think maybe because of the way I heard it because it wasn't anything visual, and I think that the visual part of it sticks in my mind, because I know that once I walked into that Tv room, the first thing I saw was like blue sky and red light on the...

Interviewer: *Uh-huh.*

STUDENT: So that's probably why I remember it being later than that.

Interviewer: *Uh-huh... What? I'm sorry?*

STUDENT: Maybe I went downstairs to visit someone after I had been in my room, but I...I don't remember this...at...all.

Interviewer: *Hmmm....so you think that....that both things may have happened? That both ways may have happened?*

STUDENT: Right. I think that maybe I just heard it on the radio first, and then I went downstairs and saw it. I don't remember hearing it on the radio.

Interviewer: *Uh-huh.*

STUDENT: At all. Maybe that's why I went downstairs--because I didn't have a Tv in my room.

Interviewer: *Uh-huh...uh-huh. On here you kept cleaning while you listened to the radio for more updates.*

STUDENT: Uh-huh.

Interviewer: *And that doesn't....that doesn't seem right?*

STUDENT: I mean, it is something I'd do, because I had a messy roommate.

Interviewer: *(laughs)*

STUDENT: So I'd keep my half of the room clean. Uhm. I don't know.

Interviewer: *Does this surprise you?*

STUDENT: Yes. (laughs) This is really weird-cause I don't remember filling out the survey. I must have done this so fast...

Appendix J: Interview 53 and how metamemory explanations were coded.

INTERVIEW CODE 053

The transcript below was coded as having had one or more of the following explanations given by the student at some point during the transcript.

Category	Description
T1 Error	I must have made an error (at T1) when I wrote it down on the day after the event which I've since corrected…or perhaps I just didn't take T1 seriously at the time.
Self-knowledge:	Subject searches self-knowledge and offers a truthy detail known now (at T3) about life and the general milieu back then.
Visual Image:	T1 doesn't match the visual image I now see in my mind at T3.
Can't deny the evidence	Logically, my handwritten, day-after account (T1) must be accurate, but I still just don't remember it happening that way.

4c. After the questionnaire from T1 is placed on the table

STUDENT: Oh, I remember that, I think...being that it's my handwriting.

Interviewer: *(laughs) "....at approximately 12:45 pm," on the way to class, and he was listening to the radio.*

STUDENT: I don't know, man... I must have been wasted or something when I wrote that. Uhm...

Interviewer: *What do you think about the differences?*

STUDENT: How could it be 12:45? It's like...no way!

Interviewer: *I don't know. But, this is...this is, uh...*

STUDENT: I mean, that's like right after it happened.

Interviewer: *Uh-huh.*

STUDENT: Hmmm. I don't know. Something's not right.

Interviewer: *Yeah, I mean...what do you think about how the differences came out? What do you postulate as a reason why? Can you explain any of this?*

STUDENT: Probably what happened was, I probably didn't feel like filling this (T1) out, so I probably just ran through it in two seconds to get the hell out of there. That's probably what happened.

Interviewer: *Uh-huh. Do you know when you filled this one out?*

STUDENT: Freshman year.

Interviewer: *The day after the shuttle exploded.*

STUDENT: Yeah I read that...it said January 29th.

Interviewer: *Yeah... Yeah.... Do you think it's possible that this (T1) happened?*

STUDENT: Nope.

Interviewer: *No?*

STUDENT: No, 'cause I mean, the shuttle crashed...it blew up around 11 o'clock. I think. I'm pretty sure. Maybe I'm wrong though. I have no idea. Maybe I had an 11:30 class and not 10 o'clock.

Interviewer: *Uh-huh. But you don't think you could have been going to class?*

STUDENT: Huh?

Interviewer: *You don't think you could have been going to class?*

STUDENT: No, I was definitely coming back from class.

Interviewer: *Uh-huh. Uh-huh. When you have a memory like that, how do you know which one... I mean, how do you make the decision of which one is right and which isn't? (pause) What do you base it on?*

STUDENT: Well, I base it on what I think now...I guess.

Interviewer: *And how do you...? How can you tell...that that's the one?*

STUDENT: Well, I guess that, looking back, I can't. I mean this is the day after it happened. I don't know.

Interviewer: *Is this the same class, do you think, that you're referring to earlier? This, it says "going to a religion class."*

STUDENT: Yeah. Boy I hated that class.

Interviewer: *Uh-huh. But this one would say it was later in the day...and now you think that...*

STUDENT: Maybe it was later in the day. I just don't think that it was. I don't know. Believe it or not, I could be wrong.

Interviewer: *Uh-huh. I just.... There's a few more questions here. (turn to page 2). "12:45" So the time is different. Now you think that it was happening after class instead of on the way to class.*

STUDENT: It was definitely happening...it happened after class.

Interviewer: *Uh-huh. Did you have another class before this one?*

STUDENT: I don't think so.

Interviewer: *Ok. "In the dorm. Getting ready to go to class. Who told you? Daniel. Who else was present? Jamie."*

STUDENT: I don't know. Oh, God.

Interviewer: *What? Same guys. The people are the same.*

STUDENT: See, I could have sworn I was walking back...walking to...walking back from class with him. I don't know. Hmmm….

Interviewer: *So you watched it for hours and discussed it with friends.*

STUDENT: And I did say 5 hours. I remember that.

Interviewer: *Yeah, 5 hours... Exactly. "Went to class... What did you do immediately afterward? Went to class and thinking about what I had just heard."*

STUDENT: I don't know. This must be some CIA plot or something…

Interviewer: *(laughs) Yeah, we actually did all this reconstructing, just to...*

STUDENT: Yeah, in MY handwriting. In my sloppy handwriting. Look at that. This is sad.

Interviewer: *Everybody says that when they look at their first questionnaire. But anyway.. So, if I could just ask you one more question. Do you think that uhm.. So you.... You think that there's...there might be something wrong about this? It tends to seem...*

STUDENT: Well, I guess this (T1) would be closer. I mean, this happened right? So I guess that's right and I was thrown off.

Interviewer: *If.. If.. All I know is that they are different. I have no way of knowing which is right. Do you... I was wondering how can you explain the difference...that there are differences in here? What do you think caused them, or whatever? How do you think that they changed over time?*

STUDENT: Well, it's just time. Everything gets blunted a little bit, don't you think? So it's just like...when it just happens everything's sharp in your mind, but after awhile, it's like...it just dulls everything, I guess.

Interviewer: *So what did you go on when you... today, when you were recalling that it was class? How did you....if it had sort of dulled somehow, how did you come up with the, uh...the answers that you gave earlier?*

STUDENT: I don't know. I thought I was right.

Interviewer: *Did it seem dull at the time you were telling me about it?*

STUDENT: No. It didn't seem it. Maybe, you know... I don't know. Maybe time changes things.