

Constraints on memory

DAVID C. RUBIN

Commenting on this conference is a hard task. Every clever slant I could think of, and many I could not, were covered by comments in the continuing open discussion. I reflected on what others might do in this situation, and chose Allen Newell as a model. What he did to organize his discussion, on at least one occasion like this, was to spend half of his space on an issue not directly related to the papers of the conference. He had something worth saying that is as appropriate to this conference as it was to his, so I will just use his talk again. After all, he first gave his discussion in 1972 and we have heard here how confused memories can get over time. Newell began as follows.

I am a man who is half and half. Half of me is half distressed and half confused. Half of me is quite content and clear on where we are going.

My confused and distressed half has been roused by my assignment to comment on the papers of this symposium. It is curious that it should be so. We have just listened to a sample of the best work . . .

Psychology, in its current style of operation, deals with phenomena. . . . The number is so large it scares me. . . . [Our phenomenon is "flashbulb" memory.]

Psychology also attempts to conceptualize what it is doing, as a guide to investigating these phenomena. How do we do that? Mostly, so it seems to me, by the construction of oppositions – usually binary ones. We worry about nature versus nurture, about central versus peripheral, about serial versus parallel, and so on. . . . [Our opposition is are flashbulb memories qualitatively different from other memories: an opposition McCloskey and Brewer analyze in detail in chapters 11 and 14.]

As I examine the fate of our opposition, looking at those already in existence as a guide to how they fare and shape the course of science, it seems to me that clarity is never achieved. Matters simply become muddier and muddier as we go down through time. Thus, far from providing the rungs of a ladder by which psychology gradually climbs to clarity, this form of conceptual structure leads rather to an ever increasing pile of issues, which we weary of or become diverted from, but never really settle. (Newell, 1973, pp. 283–289)

Newell offers three possible paradigms that might help science cumulate more efficiently: build a complete processing model, analyze a complex task, and use one program for many tasks. As this conference was convened to discuss the complex task of the formation and recall of flashbulb memories,

the second paradigm is the most applicable. Newell described it in the following way.

Focus a series of experimental and theoretical studies around a single complex task, the aim being to demonstrate that one has a sufficient theory of a genuine slab of human behavior. All of the studies would be designed to fit together and add up to a total picture in detail. (Newell, 1973, p. 303)

The key words are "in detail." Illustrations of the beginnings of this strategy included studies of mental arithmetic and chess.

We are better off now than in 1972. Instead of being half content and half confused, I am closer to 80% content and 20% confused, and had Newell been the discussant at this conference, I hope that he would be too. Some closure has come. This conference supports Newell's suggestion of analyzing a complex task or phenomenon as a good way for cognitive psychology to proceed, especially when a phenomenon provides regularities or extends the range of our database in a way that challenges and extends existing theory (Rubin, 1989). It also convinces me that Newell was correct in worrying about the damage done by our tendency to develop dichotomies to explain complex human behavior. As Newell argued, more complex, but well-defined, theories are more likely to increase our understanding. Over the last 18 years the field has begun to follow his advice. In Newell's view, we need to view flashbulb memories as "a genuine slab of human behavior" rather than just as a small isolated phenomenon or as half of a dichotomy with normal memory as the other half, and we need to develop "a sufficient theory" of those memories known as flashbulb memories. This is something this volume begins to do. Even its framings of the dichotomy question look to a general and sufficient theory of memory (McCloskey, chapter 11; Brewer, chapter 14). With this caution in mind let us return to flashbulb memories.

The blind people and the flashbulb

We came to the study of flashbulb memories with different biases and interests. These shaped what we expected, what we looked for, what data we collected, and what theoretical ax we ground. Our papers are a projective test of our theories and measures. They are a reasonable survey of approaches to cognitive psychology as it is practiced today. We have viewed flashbulb memories in about as many ways as the blind men viewed the elephant.

Let us start at the beginning. Flashbulb memories are a phenomenon that Brown and Kulik named in 1977, though they had been studied much earlier in psychology (Colgrove, 1899). Roger Brown is very good at naming and describing such fertile phenomena; the tip-of-the-tongue phenomenon is another well-known terms of his (Brown & McNeill, 1966). In a fashion not

unlike Newell's, he views describing and trying to understand phenomena as an important contribution to psychology (Brown, 1989). Brown and Kulik studied what they saw as the phenomenon's distinctive feature, the detailed recall of personal circumstances that were of no real importance to the central event. Thus, in large part, what defined the phenomenon was the lifelike recall of what a historian would consider irrelevant details. At this conference, Larsen (chapter 3) and others extended this view.

To provide a concrete example of how varied the perspectives are, I will consider my work first. Kozin and I (Rubin & Kozin, 1984) probably grabbed the elephant's tail. To us, vividness was the defining feature that made flashbulb memories special. We asked undergraduates for their three most vivid memories because we thought that Brown and Kulik were correct for their database but needed a broader database to check their theorizing: a standard move I had made before in extending other areas of my PhD adviser's work (Rubin, 1975, 1988). As a measure of the diversity of opinion (or the influence Kozin and I had on the field) note that no one here shared our view that vividness was the defining feature of flashbulb memories and many participants did not even measure it.

At the conference there were two invited outside views. They were expected to be different from the others, and so there is no problem here. Gold (chapter 7) viewed flashbulb memories from the point of view of the physiological mechanisms underlying the behaviors that the rest of us are studying. Loftus and Kaufman (chapter 10) viewed flashbulb memories from their relevance, irrelevance, and annoyance to the study of eyewitness testimony, a topic in which, from a practical standpoint, accuracy and distortion are everything. The rest of the participants, to whom the elephant was our central topic of study, however, showed as much variance.

Larsen (chapter 3) defined "flashbulb-like" memories using confidence. The memories that he was confident he would later recall were explored. Larsen studied central versus peripheral events because of a prior interest in a similar issue (Larsen, 1988) and confidence fell out of his measures and theoretical ideas. Christianson (chapter 9) as well as Reisberg and Heuer (chapter 8) were brave enough to examine flashbulb memories from the perspective of the role of emotions in memory in general.

Others including Warren and Swartwood (chapter 5) looked at consistency, and Gold told us clearly this was not the same part of the elephant as accuracy. Consistency was used partly because accuracy could not be and partly because it is interesting in its own right. People's memories are their memories whether or not they accurately reflect an actual event. The stability of those memories is a valid and theoretically informative question independent of the issue of accuracy.

Pillemer (chapter 12) examined the functions of telling flashbulb memories: the emotional impact of their telling for catharsis, their role in establishing

trust, and the increase in communication that specific details can give. Examining function is a useful approach to add, and as Bruce (1989) has noted, one we should consider more often. Consistent with this functional approach, Pillemer (chapter 6) as well as Warren and Swartwood added developmental data and considerations.

Neisser and Harsch (chapter 2) grabbed the elephant at two places at once. Their contrast between accuracy and confidence has concerned others, including Brewer (1986), and is part of Neisser's long-standing attempt to argue against the reappearance hypothesis: the hypothesis that fixed stored memories reappear to consciousness (Neisser, 1967).

It is hard to fit the work of Bohannon and Symons (chapter 4) and their colleagues into the blindman metaphor. They appear to be so interested in the phenomenon and have spent so much time with it (Bohannon, 1988; Bohannon & Schmidt, 1989; Schmidt & Bohannon, 1988) that they have made most of the possible approaches.

The study of flashbulb memories is rich in part because of this diversity. We could not do without any of them. But we must be careful that the diversity does not lead to Newell's (1973) conclusion that "Clarity is never achieved. Matters simply become muddier and muddier as we go down through time" (p. 289). The way Newell might suggest we avoid this is to keep the problem of flashbulb memories as "a genuine slab of human behavior" in need of a detailed theory, and not let it become a dichotomy or a phenomenon that is isolated from related behavior.

Putting it all together

Can we integrate these views and the data they produce?

I have very few ideas, so I keep using the same one again, with a little modification. Here Steen Larsen, Ira Hyman, Jr., and others helped with the modification of ideas about multiple constraints that have been developing at Duke (Hyman & Rubin, 1990; Rubin 1988; Rubin, Stolfus, & Wall, 1991; Rubin & Wallace, 1989; Wallace & Rubin, 1988, 1991).

Flashbulb memories are constrained by many factors. The original stimulus is not always the most important of these. The following are a number of constraints drawn from this conference and the earlier literature.

As Neisser (1982) pointed out in his criticism of Brown and Kulik, the canonical categories of flashbulb memories are part of narrative structure. Flashbulb memory must be in good narrative form in order to make a good story to tell and to recall. Fivush and Slackman (1986) and Pillemer (chapter 6) note that if you have the mind of a 3-year-old, you do not create a mature narrative structure, and free recall suffers.

As Pillemer, Fivush, and others have commented, our culture helps organize and specify what we should recall. Thus when we tell someone about the

Challenger explosion, we try to present new information and that information is more likely to be about our experiences than what was on the evening news. Besides, Pillemer notes that concrete details are needed to serve the other functions of memory, such as the functions of insuring response and establishing trust. The two constraints of having good narrative form and fitting into cultural norms for communication combine to make flashbulb memories good stories full of personal details.

Our life narratives, independent of the particular event being recalled, are a constraining factor. This life story defines the self in terms of a sequence of consistent memories (Barclay, 1986; Brewer, 1986; Greenwald, 1980; Robinson, 1986). This consistent life story imposes constraints on the contents of flashbulb memories and was probably central in Pillemer's example of a student's comments on her essay leading to a career choice.

There are also the standard constraints of memory itself. Memories without vivid images are less likely to be recalled. Moreover, the imagery of details leads to a sense of the memory being real (Brewer, 1986; Johnson & Raye, 1981) and functions to increase communication as noted by Pillemer (chapter 6). Emotionality of the events in flashbulb memories helps recall, as noted by Christianson (chapter 9), or at least seems to slow forgetting, as noted by Reisberg and Heuer (chapter 8).

Brown and Kulik postulate rehearsal as a mechanism to insure access to flashbulb memories. Rehearsal, especially spaced, helps people remember. Rehearsal in the first few hours and then very spaced, as Neisser and Harsch (chapter 2) have noted, may increase the likelihood of recall, though it might not help its consistency or accuracy. Rehearsal at 2 weeks and 2 months will help people remember 2 years later, as Warren and Swartwood (chapter 5) found. There are also the details of the event itself, but these have to be considered in terms of how well they fit the other constraints. From the data and Gold's comments (chapter 7), it may take a week or so for all of this to settle down.

From the combination of these factors we would expect flashbulb memories to be in good narrative form, containing information that is new and potentially interesting to the listener, consistent with the teller's view of the self, and to contain concrete, imageable details as well as emotional impact and reactions. Distortions from the original event should be in the direction of these constraints. When emotional arousal increases rehearsal, often in the form of information seeking, it should lead to a greater amount of recall, but not necessarily to greater accuracy or consistency. This list of factors is far from exhaustive and further still from Newell's call for a complete detailed theory, but I am only a discussant and flashbulb memories are not chess. Nonetheless, it is hard to imagine a detailed theory that would not include the interplay of at least these factors.

Suggestions for the ambulance chaser

What is the minimum set of experimental conditions that could begin to answer the questions considered at the conference? Although the previous sections were greatly influenced by those who attended the conference, the answer to this question is entirely theirs. My only role is as a collector, distorter, and reporter of ideas. Portions of this section came not only from the participants listed in this book, but also from those who participated but did not deliver papers, including Darryl Bruce, Henry Ellis, Joe Fitzgerald, Robyn Fivush, Ira Hyman, Jr., Makiko Naka, and Colwyn Trevarthyn, among others.

All data can be useful in some way, but we now have issues that cannot be settled without more controlled study. Research should continue even if all conditions of an ideal experiment cannot be met, but formulating an ideal experiment and therefore making it open to consideration and debate is a useful undertaking, especially when the phenomenon under study leaves little time for planning once an incident occurs.

The minimum ideal experiment needs recalls to be taken both at a short retention interval and a long retention interval, from a single person, after an emotionally arousing event. An accurate description of the event and the subject's first exposure to it would be useful to distinguish accuracy from consistency. The long retention interval should be one month or longer to be well beyond the 1-week interval that the data presented here indicate may be a turning point for flashbulb memories. For different subjects, the short retention interval should be either: (a) as soon as possible, but definitely within 24 hours, (b) about three days, or at (c) about 1 week. These intervals were chosen because, for the data presented at the conference by different experimenters, there is much better agreement between the memories at 1 week and 1 year than between memories at 1 day and 1 year. Some probing of these times is therefore needed within one experiment to see if the differences observed are artifacts of different experimental procedures or subject populations. If the difference in consistency between 1 day and 1 week and later recalls is real we need the three short intervals to begin to understand the time course of this effect. Different subjects were suggested for each short time, to prevent the repeated recall from fixing the recall. A within-group procedure, however, with recalls taken at many intervals would be a good addition to track the changes, although this procedure should lead to more stability than a design with one only long and one short retention interval (Cofer, 1943).

For some subjects, a complete log of every time they gained new information about the event, or talked about it, is needed for at least the first day or two after the event. This is because some of Neisser and Harsch's (chapter 2) subjects who appear to be wildly constructing memories could be report-

ing accurately about two or more different times in which they heard about the *Challenger* exploding, although they were always asked for the *first* time. This is Brewer's (1988) "wrong time slice" response (p. 53). We need to know whether the differences between short and long retention periods are the result of a major reconstruction or just a lapse in memory for the first time in favor of a more vivid second, third, or fourth time.

Several factors have been postulated as playing an important role in flashbulb memories, and measures of these should be taken close to encoding (i.e., at the short retention interval) and at the time of later recall (i.e., at the long retention interval) to begin to distinguish effects present at encoding and retrieval, as opposed to encoding and retrieval effects (Watkins, 1990). The factors include at least general emotional arousal, specific emotional arousal for aspects of the event that might be recalled, and measures of rehearsal. Both "thought about" and "told about" measures might be taken or combined as rehearsal (e.g., Rubin, Groth, & Goldsmith, 1984). The number of times the event was talked about, in contrast to being thought about, includes the number of times that new information could have been added, possibly distorting the final recall.

In all of this there is a need to compare flashbulb memories to "control" memories. The concept of control is difficult because theoretical constructs that differ across experiments determine which aspects of flashbulb memories need to be controlled. There is also the practical problem of getting "control" events to be recalled at all at the long retention interval. In any case, the "control" memories cannot be replaced by a vague idea of what people would recall or by the assumption of perfect recall (Schmidt & Bohannon, 1988).

Another vexing problem for the especially ambitious ambulance chaser is the distinction between central and peripheral events. Brown and Kulik stressed that the observation in need of explanation is not why people remember the nationally important event, but why they remember trivial details of their lives that occurred at the time. The problem is how to define what is central and what is peripheral. The issue in the conference that hinged most on this is whether emotionality focuses attention on the central, emotion-provoking aspects of the event or not.

By clever experimentation and thoughtful theory we have made progress, but in doing so we have set ourselves a difficult task. I wish us all good luck.

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Edited by

EUGENE WINOGRAD

and

ULRIC NEISSER



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