

Flashbulb memories*

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Abstract

Flashbulb Memories are memories for the circumstances in which one first learned of a very surprising and consequential (or emotionally arousing) event. Hearing the news that President John Kennedy had been shot is the prototype case. Almost everyone can remember, with an almost perceptual clarity, where he was when he heard, what he was doing at the time, who told him, what was the immediate aftermath, how he felt about it, and also one or more totally idiosyncratic and often trivial concomitants. The present paper reports a questionnaire inquiry into the determinants of such memories by asking about other assassinations, highly newsworthy events, and personally significant events. It is shown that while the Kennedy assassination created an extraordinarily powerful and widely shared flashbulb memory, it is not the only event that has created such memories. The principal two determinants appear to be a high level of surprise, a high level of consequentiality, or perhaps emotional arousal (assessed by both rating scales and ethnic group membership). If these two variables do not attain sufficiently high levels, no flashbulb memory occurs. If they do attain high levels, they seem, most directly, to affect the frequency of rehearsal, covert and overt, which, in turn, affects the degree of elaboration in the narrative of the memory that can be elicited experimentally. Parallels are made explicit between the behavioral theory and a less elaborated, speculative neuro-physiological theory of which R. B. Livingston (1967) is the proponent. Finally, an argument is made that a permanent memory for incidental concomitants of a surprising and consequential (in the sense of biologically significant) event would have high selection value and so could account for the evolution of an innate base for such a memory mechanism.

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“Hardly a man is now alive” who cannot recall the circumstances in which he first heard that John Kennedy had been shot in Dallas. Not just the *fact* that John Kennedy was shot and died; we remember that too, of course, but we really do not need to since it is recorded in countless places and in many forms. It is not the memory of the tragic news that invites inquiry, but the memory of one’s own circumstances on first hearing the news. There is no obvious utility in such memories.

The second author recalls: “I was seated in a sixth-grade music class, and over the intercom I was told that the president had been shot. At first, everyone just looked at each other. Then the class started yelling, and the music teacher tried to calm everyone down. About ten minutes later I heard over the intercom that Kennedy had died and that everyone should return to their homeroom. I remember that when I got to my homeroom my teacher was crying and everyone was standing in a state of shock. They told us to go home.”

The first author recalls: “I was on the telephone with Miss Johnson, the Dean’s secretary, about some departmental business. Suddenly, she broke in with: ‘Excuse me a moment; everyone is excited about something. What? Mr. Kennedy has been shot!’ We hung up, I opened my door to hear further news as it came in, and then resumed my work on some forgotten business that ‘had to be finished’ that day.”

Ten years after the assassination, the always-enterprising *Esquire* magazine (1973) asked a number of famous people a question similar to ours: “Where were you?” Julia Child was in the kitchen eating *soupe de poisson*. Billy Graham was on the golf course, but he felt a presentiment of tragedy. Philip Berrigan was driving to a rally; Julian Bond was in a restaurant; Tony Randall was in the bathtub. The subtitle of the 1973 *Esquire* article could, we are sure, be used again today: “Nobody forgets”.

Probably everyone who has read until this point is primed with an account of his own, which he would rather like to tell, perhaps because there is something strange about this recall. John Kennedy was shot thirteen years ago. What else can one remember from 1963? Almost everyone testifies that his recall of his circumstances is not an inference from a regular routine. It has a primary, ‘live’ quality that is almost perceptual. Indeed, it is very like a photograph that indiscriminately preserves the scene in which each of us found himself when the flashbulb was fired. But why should the human species have such a flashbulb potentiality? Where is the use in carrying certain scenes in permanent store?

“Flashbulb memory” (FB) is a good name for the phenomenon inasmuch as it suggests surprise, an indiscriminate illumination, and brevity. But the name is inappropriate in one respect that had better be brought forward at

once. An actual photograph, taken by flashbulb, preserves everything within its scope; it is *altogether* indiscriminate. Our flashbulb memories are not. The second author's crying teacher had a hairdo and a dress that are missing from his memory. The first author faced a desk with many objects on it, and some kind of weather was visible through the window, but none of this is in his memory picture. In short, a flashbulb memory is only somewhat indiscriminate and is very far from complete. In these respects, it is unlike a photograph.

Is it only the news of John Kennedy's assassination that has ever set off the flashbulb registration of each person's circumstances on first hearing the news? Anticipating our data, it seems to have precipitated the effect in greater strength, and for a larger number of persons, than any other event of recent history. However, it is not the only event that has fired flashbulbs. There are, in the first place, other events in our recent national history that have had this effect for some: the assassinations of Robert Kennedy and of Martin Luther King and the attempted assassinations of George Wallace and Gerald Ford, as well as the startling Chappaquiddick episode involving Ted Kennedy.

But unexpected events that involve nationally prominent persons simply constitute a class of events for which one may reasonably hope to uncover a good number of flashbulb memories. There are also the sundry private shocks in each person's life. Some of our older informants had, prior to 1963, been jolted by midnight phone calls bringing the sad news of the unexpected death of a parent. And slightly younger subjects heard, out of the blue, that a friend had been killed in an accident or by an overdose of heroin. Such personal jolts also cause flashbulb memories; that is, memories not just of the crucial event, but of the circumstances in which one first learned of them. What chiefly differentiates them from presidential assassinations and the like is the absence of a very large population of like-minded people. Only a few feel the shock of a family death or are interested in how you felt when you heard. There is, therefore, no named central event that one can use to retrieve possible flashbulb memories. The best one can do is to ask each informant to search his memory for events of this order.

We began with a familiar phenomenon which, however, does not follow from such well-established determinants of memory as primacy or recency or repetition, even though the data one can collect are a variety of verbal free recall. We had definite intuitions about the variables that might be important and also a large quantity of general curiosity which guided us in the construction of a very long and difficult questionnaire. When about half the data had been collected, we came upon a neuro-physiological theory that paralleled our intuitions in its own terms and we decided to bring out the

parallels in our exposition. The theory is Robert B. Livingston's (1967a, b), and it is called by the evocative name: "Now Print!"*

"The steps are postulated to occur as follows: 1) Reticular recognition of novelty; 2) Limbic discrimination of biological meaning for that individual at that moment; 3) Limbic discharge into the reticular formation; 4) A diffusely projecting reticular formation discharge distributed throughout both hemispheres, a discharge conceived to be a 'Now print!' order for memory, and finally; 5) All recent brain events, all recent conduction activities will be 'printed'..." (1967b, p. 576).

Without the neurology one may say: First comes the recognition of high novelty or unexpectedness; then comes a test for biological meaning for the individual; if this second test is met, there follows the permanent registration not only of the significant novelty, but of all recent brain events. What confirmed our interest in this theory was Livingston's first application of it: "I suggest that almost all of you will remember exactly where you were on November 22, 1963, when you heard the news that President Kennedy had been assassinated. You can probably tell us where you were, with whom, and very likely whether you were sitting, standing, or walking – almost which foot was forward when your awareness became manifest" (1967b, p. 576).

Method

We had two major intuitions about the determinant of FBs when we designed our study and before we knew of their neurological parallels in Livingston's theory. Perhaps the most obvious property of President Kennedy's assassination was its extreme unexpectedness; in most of our lives no other major political figure had been assassinated. And, in selecting events to use in prospecting for FBs, we generalized this property and so chose 10 very unexpected or novel events, among which assassinations

*Some friends, among physiological psychologists, have advised us that the 'Now Print!' theory is, as we had guessed, entirely speculative. Furthermore, and this we did not know, it has inspired little or no direct psycho-physiological research. There is apparently no clear reason why the theory could not be correct, but it has not had heuristic value in psycho-physiology and so there is really nothing clearly pro or con. We were sorry to learn that the 'Now Print!' theory has been of such slight consequence in physiological psychology and, of course, we could not very well provide any direct evidence as to its truth value with a paper-and-pencil study. In actual fact, as you will see, all of our own measures and concepts are behavioral, and our theory is completely independent of Livingston's. Nevertheless, at the considerable risk of seeming naive or willful, we have elected to build Livingston's theory into our exposition because his speculations did interest us and we see no harm in stretching an arm (or is it a neck?) in the direction of ultimate synthesis.

loom large. As a consequence, one can reasonably say that for all the events we chose, the first operation in Livingston's theory was satisfied: the registration of novelty. However, we know that the level of novelty varied a good deal, and there is some reason to suppose that the only full-fledged FB effects we obtained were for John Kennedy and for the personal shock described by each person.

The second intuition we luckily had was that among national events like assassinations, there might well be a difference between white Americans and black Americans, in the public figures who set off FBs*. How many white Americans, for instance, could say just where they were and what they were doing when they first heard that Martin Luther King had been shot? Not many, we suspected, but probably quite a few black Americans would be able to do so. What should account for a difference of this kind if it were, indeed, attained? We guessed that what would matter would be the comparative *consequentiality* for the black and white individual of each national event. And so we composed a five-point scale for the rating of consequentiality which, as we shall see, we defined in a way that makes it a plausible parallel to Livingston's "biological significance".

Our behavioral data were more fine-grained than the parallel concepts in Livingston's theory. By eliciting spontaneous accounts of whatever length and by conceiving of consequentiality as a five-point scale, we obtained data clearly important to the further development of a behavioral theory. Livingston does not attempt to account for the length or elaborateness of the memory, but our data presented us with wide variation in this respect, and we thought it possible that the rated degree of consequentiality (interpreted as biological significance) would be one of the determinants.

*Nowadays, it is perhaps the case that any study comparing black Americans and white Americans on any sort of cognitive task risks suspicion of seeking tendentious or even downright invidious comparisons. Nothing of the sort is true in the present study. We worked with black Americans and white Americans, only because there have been a number of assassinations in America in recent years which might reasonably be expected to differ in importance or emotional significance for these two demographic populations. We would expect the same kinds of differences for any two groups, such as two ethnic minorities, two professions, the two sexes or, for that matter, two individuals, providing there were highly publicized and surprising events known to both, but differing in significance. In fact, however, only recent assassinations in America and their effects on Blacks and Whites meet the requisite criteria and exist in some substantial number of instances for large populations. As we shall see, when the data are reported, our black subjects and our white subjects followed the same principles of human memory, and there is nothing at all suggestive of, or relevant to, differences in any intellectual capacity.

Subjects

Forty white Americans and forty black Americans filled out our questionnaire. The age range was 20 to 54 for Whites with a median age of 27; for Blacks the range was 20 to 60 with a median of 25. We had to tolerate these small differences of age distribution because the length of the questionnaire made it somewhat difficult to recruit enough informants. We used several means to attract informants, including newspaper advertisements and posters in Harvard University buildings*. Our collection of informants cannot be considered a random sample of any definable population. We, ourselves, think that the population for which the major results, in abstract form, hold true, may be the human species.

The Questionnaire

The heart of the questionnaire is the set of persons set down in Table 1. We used a little over two pages to describe the exact nature of the flashbulb effect — a vivid recall of the circumstances in which one first learned of some important event. Since almost everyone had such recall in connection with the assassination of John Kennedy, it was possible to illustrate the mental state we hoped to evoke with the two examples provided by the memories of the authors. All informants but two (whom we have excluded from the analysis) correctly understood what we meant. The two who misunderstood reported various facts about the events as they have been described in the press, rather than their personal circumstances on hearing the news. Essentially, the questionnaire was composed by using each of the person–event pairs of Table 1 to form the nucleus of a set of similar inquiries. We will describe here only those that are directly relevant to the argument we want to make.

Initial Free Accounts

In the case of each person–event listed in Table 1, informants were first asked: “Do you recall the circumstances in which you first heard that...?” In the event that he did not, the informant checked “no” and was directed to turn four-pages-or-so to the next person–event. Whenever he checked “yes” he was asked to write a free recall of the circumstances in any form or order and at any length he liked.

*Mr. Michael Forte, a friend and graduate student in social psychology, helped us to interest a sufficient number of black informants, and we are happy to acknowledge his assistance.

Table 1. *Chronological order of events used to search for flashbulb memories*

Name	Race	Event	Date	Place
1. Medgar Evers	Black	Shot to death	June 12, 1963	Mississippi
2. John F. Kennedy	White	Shot to death	Nov. 22, 1963	Dallas
3. Malcolm "X"	Black	Shot to death	Feb. 21, 1965	Harlem
4. Martin Luther King	Black	Shot to death	April 1, 1968	Memphis
5. Robert F. Kennedy	White	Shot to death	June 6, 1968	Los Angeles
6. Ted Kennedy	White	Drowning involvement	July 19, 1969	Chappaquiddick
7. George Wallace	White	Shot, but not killed	May 15, 1972	Laurel, Md.
8. Gerald Ford	White	Failed attempt at assassination	Sept. 5, 1975	San Francisco
9. Gen. Francisco Franco	White	Died of natural causes	Nov. 20, 1975	Madrid
10. A personal, unexpected shock, such as death of a friend or relative, serious accident, diagnosis of a deadly disease, etc.				

The first set of inquiries offered three possible criteria of a flashbulb effect: (a) the subject's simple response "yes" or "no"; (b) some number of words that we might arbitrarily require for an account to be considered a genuine flashbulb; (c) a content coding of the circumstances reported in terms of such prevalent categories as "Place", "Ongoing Event", "Informant", and so on. Of course, these potential criteria were all closely inter-correlated. However, in spite of that fact, there were reasons to prefer one possible criterion over another.

Simple reliance on the informant's "yes" and "no" would only dichotomize responses into those that are flashbulbs and those that are not, whereas many things indicated that the division was not so absolute and, more importantly, that within the accounts themselves there was much to interest us. Adding up the number of words (or any other objective index of length of account) would enable us to represent the fact that flashbulbs varied in degree, but did not represent variations as well as constancies evident to us in the content of the reports. It is possible reliably to report our conclusions about content, using content analysis, but these conclusions cannot be proved to be necessary emanations of the data. Still, they are too suggestive and, in our eyes, obvious to go unreported.

The first author read 20 FB accounts of the assassination of President John Kennedy, and to him it seemed that there were only six classes of information reported in 50 per cent or more of the accounts. An informant

was most likely to report the "Place" in which he learned of the assassination, the "Ongoing Event" that was interrupted by the news, the "Informant" who brought him the news, "Affect in Others" upon hearing the news, as well as "Own Affect" and finally some immediate "Aftermath", for himself on hearing the news. Sampling the flashbulb accounts for all nine historical events, it appeared that the six categories listed were a kind of "canonical" form for the historical FB memory in the sense that they were more likely to be recalled than any other content though, of course, no informant always used all six.

It is important to bear in mind that the canonical categories listed are abstractions. Each informant's "Place" of hearing the news and "Ongoing Activity" and so on, was, of course, unique. The variation is dramatic: "... conversation with a classmate at Shaw University in North Carolina"; "...engaging in a game of softball"; "...talking to a woman friend on the telephone"; "... working for a market research organization"; "... I was having dinner in a French restaurant"; etc. For an instant, the entire nation and perhaps much of the world stopped still to have its picture taken.

In addition to the variation within each canonical category, there was, in many records, a sentence or so that fit none of the abstract categories, but was as idiosyncratic on the abstract level as on the concrete: "The weather was cloudy and gray"; "She said, 'Oh, God! I knew they would kill him'"; "... We all had on our little blue uniforms"; "... I was carrying a carton of Viceroy cigarettes which I dropped...". Responses like these fell outside the canonical categories and also were so unlike one another as to resist grouping in some new category. Is it possible that so endlessly diverse a collage satisfies one law? Both facts about the content are important: the existence of six abstract canonical categories into which most of the, always unique, content could be easily and naturally placed; the existence in some accounts, but not all, of completely idiosyncratic content that the first author could not subsume under any recurrent categories.

The personal unexpected shock question which appears as No. 10 in Table 1, as it did in the questionnaire, is unlike the other questions in that it does not name a historical person and event, known to all, but asks the informant if he has had experience of a personal event that caused a flashbulb recall. Consequently, the personal *event*, as well as the circumstances upon hearing of it, must be unique. The question was different enough from the others to suggest that there might be some differences in content categories, and there were.

The first author once again read 20 accounts, this time of personal shocks, and formed an inductive impression, whose general inevitability cannot be proved. Two categories were, however, necessitated by the form of the

question: the nature of the event and the person involved, and these were always reported. The unexpected death of a parent was much the most common severe shock experienced by these, for the most part young, people. One set of categories duplicated categories in the canonical form for the historical events: "Place", "Ongoing Event", "Informant", "Own Affect", and "Aftermath". These five most common response categories omit only "Other Affect" from the pattern for historical incidents and it is, perhaps, seldom mentioned because of the stress on "personal" in the question lead.

Two additional categories ("Event" and "Person") were invariably found here, though not in the historical cases. They may both be explained by differences in what the informant might reasonably expect the E to need to know: "Event", "Person", "Cause", and "Time" would all be unknown to E. Their addition to "Place", "Ongoing Event", "Aftermath", "Informant", and "Own Affect" seems simply to represent intelligent adaptation to a different sort of question.

Having defined the two sets of canonical categories as precisely as he could, the first author wrote a set of coding rules for the second author to apply to the 20 accounts of circumstances attending John Kennedy's assassination and also another set to be used to score the 20 personal accounts. Even on their initial check on interscorer reliability, the scorings of the two authors were not far apart, presumably because the categories are familiar ones, fuzzy only at their edges. Inevitably, however, there were small differences of definition and presupposition to be resolved, and this was done, not once but several times. It proved impossible to attain perfect agreement on the individual categories, at least in a tolerable period of time. Three formal studies of inter-scorer reliability were made, using different sets of protocols, with the results being 88% agreement, 89% agreement, and 94% agreement, or an average of 90% agreement. This seemed satisfactory to us because the residual differences were really peculiar to individual accounts and hardly solvable by rule.

Scorings of informants' accounts in terms of total number of scored content categories invariably yielded high reliability coefficients. We judged it necessary not to be satisfied with these results, but to develop inter-scorer reliability also with respect to individual content entries since we would want to theorize about results on this level. The data were coded throughout by the first author and also in large samples by the second author. Differences were resolved in discussion.

A "yes" answer to our initial question and a canonical content score of 1 or more defined the flashbulb (FB) effect in this study. Of course, the higher the content score, the more elaborated the account. However, since the

coding is ultimately not an “objective” feature of the data, we shall also sometimes cite number of words, an objective index of the degree of elaboration.

Consequentiality

For each of the ten persons referred to in Table 1, there was a 5-point Consequentiality Scale, labeled “Little or no consequentiality for me” at “1” and “Very high consequentiality for me” at “5”. The scale came at the end of the questionnaire to minimize the likelihood of disclosing the point of the inquiry.

We spilled a lot of ink in our questionnaire trying precisely to define consequentiality and beseeching our informants to keep the exact sense always in mind, answering as painstakingly as possible. To quote our own efforts at defining the concept: “In order to rate the consequentiality in your life of the death of someone, let us say President John F. Kennedy, you must try to imagine the things that might have gone differently had President Kennedy lived”. We pointed out that not only world figures had consequentiality for oneself, but also, obviously, relatives, friends, admired persons and others could be very consequential. To quote again: “Probably the best single question to ask yourself in rating consequentiality is, ‘What consequences for my life, both direct and indirect, has this event had?’ ” While no one could possibly tote up all the consequences for himself of any particular event, the judgment proved to be one informants could make and, in the data, there are several indications that they followed our directions. It is certain that they did not simply report attitudes or historical prominence.

Rehearsal

For the purposes of this paper it remains only to describe several items included in the set of questions asked concerning each figure in Table 1. To investigate the role of rehearsal as a determinant of flashbulb memories, we asked each informant to indicate, if he gave a flashbulb account at all, how often he had related that account:

“... never told anyone.”

“... gave the same account roughly 1–5 times.”

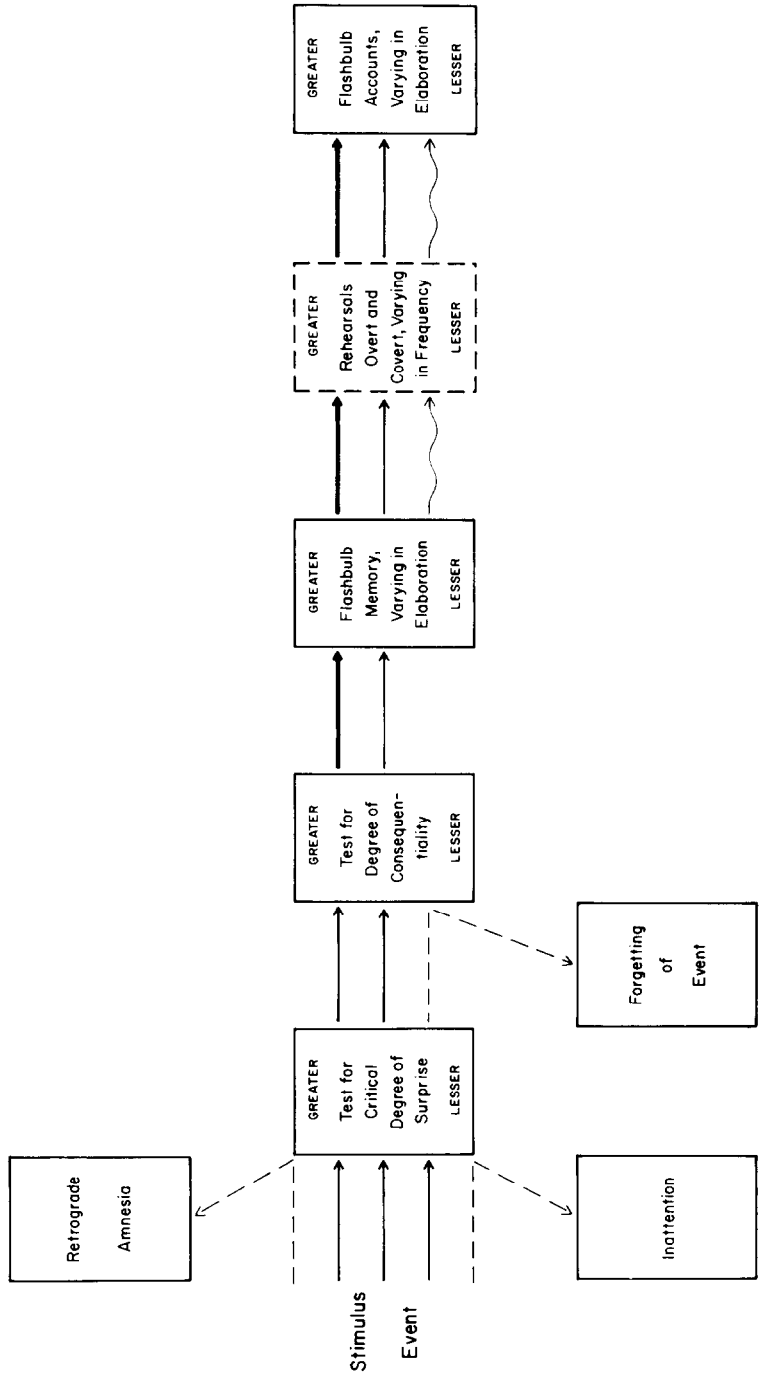
“... gave the same account roughly 6–10 times.”

“... gave the same account more than 10 times.”

Advance Overview

The data are, of course, all correlational, but the cause-and-effect construction we shall put on them is as follows. The written account of a memory satisfying our definition of a FB *account* is to be thought of as the depen-

Figure 1. Schematic flowchart showing the creation of flashbulb accounts.



dent variable. A FB account defined by a “yes” answer to the opening question and the use of at least one canonical category. The FB account is conceived not as an absolute, but as an effect varying in elaboration both across informants and events and within informants with the event fixed and the retrieval cues changed. Elaboration is indexed either by number of canonical categories or by number of words.

Our preliminary model of the process represents a behavioral flow chart paralleling the major features of Livingston’s “Now Print!” theory. We agree with Livingston that the registration of surprise and unexpectedness in the central nervous system is the first step and the *sine qua non* of all else (see Figure 1). Thus, some, as yet undetermined, level of novelty may be viewed as the first hurdle that a stimulus event must overcome before the central nervous system will “take a picture”. Determination of the requisite degree of surprise necessary for FBs is made difficult by at least two problems. First, there is the obvious problem of accuracy associated with retrospective accounts of surprise. Second, the relationship between degree of surprise and FBs may not be linear. The phenomenon called “retrograde amnesia” suggests that there may be a level of surprise or shock that is too great for a FB memory, and the general dependence, from childhood on, of mild arousal and attention on small departures from expectation suggests that there may be a level that is insufficient for a FB memory.

It will, therefore, be our assumption, in the present analysis, that the 10 events we selected for study were all potentially within the critical region of surprise necessary for a FB memory although the degree of surprise, of course, varied somewhat from one event to another, both between and within subjects. Livingston does not suggest that variation within the postulated critical zone of surprise influences degree of FB elaboration and we will, for the present, assume the same.

A second determinant of a FB memory in Livingston’s theory is the biological significance of the event to the organism, which Livingston treats simply as present or absent. We have collected data on two measures of consequentiality, one direct measure and one relatively indirect. The direct measure simply asked the subject to rate the degree of consequentiality that the particular event had had for his or her life. Although such a measure has obvious face validity, it is less than ideal in testing the model in that it is largely retrospective and, therefore, does not really tell us exactly how the subject viewed the consequentiality *at the time* of the event.

Our second measure of consequentiality concerned the race of the subject (black or white) in relation to the historical event. We believed that events which involved leaders who were prominent in American race relations (whether pro- or anti-civil rights and whether black or white) would have

greater consequentiality for Blacks as a group than for Whites. Leaders who are involved with race relations are particularly salient and potentially important to a minority group which is still struggling for full equality. Although this measure of consequentiality is thus largely intuitive, it has the advantage of assessing more accurately the likely degree of consequentiality at the time of the event.

One of our hypotheses is that the degree of elaboration in FB accounts (canonical content scores) of a group will be positively associated with the mean consequentiality scores given by the group. We thus go beyond Livingston in proposing that neither biological significance (consequentiality) nor FB accounts is an either-or matter, but that both vary in degree and that they vary together (see Figure 1).

As can be seen in Figure 1, we have made an essential distinction between Livingston's theory and our model based on the data we were able to collect. His theory concerns a certain kind of memory, described in hypothetical neurological terms. We had no means of access to the FB memory and neither, of course, did he. What we do have is a collection of FB verbal accounts which were elicited by a particular means of retrieval. The retrieval cue was: "Do you recall the circumstances in which you first heard that...", with the question completed in 9 cases by a generally familiar person-and-event and in one case by a request for some personal surprising event. We call these verbal accounts "FB accounts" when the informant said "yes" to the question and included at least one canonical content category in what he wrote.

What relation shall we suppose to exist between our FB accounts and Livingston's FB memories? We think the accounts are ultimately derived from the memories but that the two cannot be identical. We postulate, with Livingston, a FB memory fixed for a very long time, and conceivably permanently, varying in complexity with consequentiality but, once created, always there, and in need of no further strengthening. However, our guess is that the *memory* is not a narrative and not even in verbal form, but represented in other, perhaps imaginal, ways. How is a particular FB account derived from the one FB memory? Our suggestion is that the important mediating process is rehearsal, both covert and overt.

We propose that higher consequentiality of an event for an individual works both to make more elaborate flashbulb memories and also to compel more frequent rehearsal of that which is all or part of the FB memory. An event which has great consequentiality for an individual is more likely both to be "on the mind" of the person (covert rehearsal) and to be worked into conversation (overt rehearsal). However, we doubt that this rehearsal of the memory is a simple reproduction of the brain events constituting the

memory, but think it must also be a constructive process, especially when it is an overt account. Probably, the rehearsal process, set off by high consequentiality, draws its content from the unchanging FB memory, but, in rehearsal, a verbal narrative is likely to be created.

We propose that rehearsals build up associative strength between the verbal narrative created and the (retrieval) cues used in the various settings. It seems likely that the sort of cue that elicited overt rehearsals in our subjects in the past would have been similar to our cue in the present study. A typical cue in our experience has not been, "Do you remember the facts of John Kennedy's assassination?", but rather one more along the lines of "Do you remember what you were doing when you heard that John Kennedy had been assassinated?" If such is the case for our informants, we might expect informants who report more frequent rehearsals to have easier access to their verbal accounts by virtue of having relatively greater associations between cue and verbal narrative. In addition, the fact that qualitatively different cues are also likely to have been used would build additional associations between those cases and different aspects of the FB memory. Subjects who have rehearsed their accounts should thus be more likely to give more extensive verbal accounts in the present scheme. It is our assumption then that the FB memory is always there, unchanging as the slumbering Rhinegold, and serving by means of rehearsal to generate some variety of accounts.

Of course, rehearsal need not be either overt or verbal (see Figure 1). Bellugi, Klima and Siple (1975) have given evidence that, in the deaf, rehearsal is manual, at least as reflected on the periphery. But that is still a semantic sort of rehearsal. We believe, with Norman, that: "When the items to be rehearsed are not words but are actions, sounds, visual scenes, tastes, or smells, then the rehearsal tends to mimic the properties of these sensory modalities. Almost nothing is known about rehearsal for nonverbal items, but almost everyone has experienced it" (1976, p. 101). Certainly we have, since we started to attend to the process. Following a sudden consequential automobile accident, one of us finds his covert rehearsal of the circumstances as uncontrollable as the tongue that seeks an aching tooth. Of course, one of the principal things we should like to know about nonverbal rehearsal is whether it tends to build into narrative accounts. Our introspection suggests that it somehow operates on the materials from the FB memory so that a narrative is promptly produced when an audience exists that cares about the story.

Our abstract speculation may be made clearer with an example. The shooting of President Kennedy was, we know, much the most surprising of all our historical events. It "bowled over" just about everybody. The rated

consequentiality of the event was, for Whites, also highest in the historical list and only slightly edged out by the category of Personal Shocks (see Table 4). For Blacks, Kennedy was also rated very high on consequentiality (see Table 5). On the evidence, John Kennedy rated as a member of almost everyone's immediate family. In these circumstances, we expect Livingston's "Now Print!" mechanism to operate and to record permanently all immediately previous and contemporaneous brain events above some level of organization. We further believe that this inaccessible memory will be more elaborated (in canonical content forms or words) than any other historical memory in spite of the fact that it occurred thirteen years ago before all assassinations but that of Medgar Evers. It was so, for Blacks as well as Whites (Tables 4 and 5).

Of course, the memory is not directly accessible and what we have, in fact, is 79 FB accounts, similar in their references to Place, Ongoing Event, and the other canonical categories but, in some irrelevant detail, always unique. These accounts are by far the most elaborated in content or in words of any historical event; in content they are slightly less so than the Personal Shocks. How should it happen that the accounts reflect the high degree of elaboration we attribute to the memories? We have data on overt rehearsals though not on covert. Overt rehearsal would be expected to be especially frequent relative to covert in just this case because there existed a national, indeed an international, highly interested audience. The overt rehearsals reported were far higher than those for any other event; 73% of Whites and 90% of Blacks reported telling their personal tales more than once and generally between 1-5 or 5-10 times. Those who did not report overt rehearsals, but nevertheless gave FB accounts, must either be assumed to have forgotten past rehearsals and/or to have rehearsed covertly. It is of some importance that no one reported an overt rehearsal within the past year. In short, we propose that frequent rehearsals, covert and overt, made accessible elaborate FB accounts because of the high consequentiality posited to produce both an elaborate memory and many rehearsals.

If all these factors work as we have hypothesized (see Figure 1), the predictions are quite simple. With an adequate level of surprise taken as given, there should be positive correlations among all of our variables: degree of consequentiality; frequency of overt rehearsals; and degree of elaboration in FB accounts. The FB memory itself is a hypothetical construct not directly measurable. Covert rehearsals also could not be measured, and this is particularly unfortunate since that leaves one free to imagine frequencies that could make up any deficiencies in the anticipated positive correlations between overt rehearsals and elaboration of accounts.

Results

In the conception pictured in Figure 1, the creation of a FB memory begins with the registration of surprise falling within a critical region. We are assuming that all 10 of our events generated surprise at a level within this region and so that the first condition for creating a FB memory was, in all cases, satisfied. The second condition is, in Livingston's version, biological significance at some level, which in our version is operationalized in two ways: a dichotomy of racial group membership and a continuous variable of consequentiality. In presenting the results, we will begin with just these factors: frequency of FB memories; group membership; and consequentiality. Of course, we are not, properly speaking, able to count FB memories, but only FB accounts. However, an account presupposes a memory (though the reverse is not the case) and so we may fairly tally accounts as memories. Results involving the entire conception pictured in Figure 1 will be considered last.

Race Membership and Frequency of FB Memories

Our advance prediction was that the 40 black informants would be most likely to register biological significance in the case of those national leaders who were most involved with American civil rights, whether the leader be black or white, a friend or an enemy of the black minority. Our intuitive guess was that three such leaders in our set were black and were clear champions of the civil rights of black Americans: Medgar Evers, Malcolm X, and Martin Luther King. These men could truly be said to have attempted to advance the position of American Blacks in a way that was ultimately biological since their immediate concerns with education, employment opportunities, and income must ultimately translate into improved opportunities for Blacks to survive and contribute to the American gene pool. The fourth leader closely identified with civil rights is former Governor George Wallace, a white man. Whatever George Wallace may have intended his rhetoric to suggest, it was clear to our black informants that he was an enemy (they rated their attitude to him as "extremely unfavorable"). Wallace seemed interested in preserving the disadvantage of the black minority. The other national leaders – Franco, Ford, and the Kennedys – seemed to us not so strongly concerned with civil rights.

In Table 2 we have the absolute frequencies of FB memories (really, of course, FB accounts) for each racial group and the 9 political leaders. It is possible to use frequencies rather than percentages because Ns were the same for both groups. Perhaps the easiest way to absorb the information in this

Table 2 *Numbers of white and black subjects reporting flashbulb memories for various events*

Event	FB Whites (N = 40)	FB Blacks (N = 40)
*1. Medgar Evers	0	5
2. John F. Kennedy	39	40
***3. Malcolm X	1	14
***4. Martin Luther King	13	30
5. Robert F. Kennedy	25	20
6. Ted Kennedy	13	10
**7. George Wallace	11	20
8. Gerald Ford	23	16
9. Gen. Francisco Franco	17	13
10. A personal, unexpected shock	37	32 (36) ^a

By chi square analysis:

*** $p < 0.001$

** p between 0.05 and 0.02

* p with Yates's correction between 0.10 and 0.05

^aFour informants said they had a FB memory for a personal shock but that it was too personal to relate, and so these 4 did not fully satisfy the definition for a FB account which includes at least 1 canonical content category.

table is to look first at the 4 leaders we have identified as strongly concerned with civil rights and so most likely to elicit FB memories from Blacks. For Malcolm X and Martin Luther King, the difference in frequency of FBs is in the predicted direction (Blacks greater than Whites) and is very highly significant. For Wallace, the difference is again as predicted (nearly twice as many FBs for Blacks as for Whites), but the significance level is lower. For Medgar Evers, only 5 informants of all 80 had a FB memory, but all 5 were Blacks, and so the difference approaches significance.

After the fact, it is clear why the Evers' FBs were so few. Medgar Evers was assassinated in June of 1963; 24 of our informants were, in 1976, between 20 and 24 years of age and so, in 1963, would have been between 7 and 11 years old. John Kennedy was also assassinated in 1963, and yet all but one of the full 80 informants, including the youngest, had FB memories of that event. Reading the accounts of their circumstances when they heard the news, it is clear that some, especially the youngest, knew nothing, or next to nothing, of President Kennedy. Had the news (inconceivably) been reported as no more than a routine newspaper headline, the early school-

age informants would not have registered surprise, nor probably would they have experienced the event as a consequential one.

In fact, however, they did, most of them, experience surprise and consequentiality. But they experienced them in the microcosms of their own lives, usually in school, where the regularities of life were disturbed by reflection from the events in Dallas. Principals made unscheduled announcements over public address systems, teachers or parents burst into tears, and school was dismissed for the day. Events unthinkably surprising and consequential when you are 7 years old. But for Medgar Evers, not a very famous figure, no schools were closed, no announcements were made by principals, some tears were shed but not so many, with Blacks still predominantly resigned to injustice.

Looking next, in Table 2, at the leaders thought not to be deeply involved in civil rights – John Kennedy, Robert Kennedy, Ted Kennedy, Gerald Ford and General Franco – we find, as predicted, no significant differences between the groups. The 10th event, a personal unexpected shock, was, of course, entirely different for each informant. The very high levels of personal FBs, almost identical for Blacks and Whites, simply means that almost everyone could find in his memory an event answering to our abstract description.

Table 3. *Mean Consequentiality scores for all subjects in two groups*

	Whites (N = 40)	Blacks (N = 40)	Significance level of difference by student's <i>t</i>
1. Medgar Evers	1.39 ^a	3.00 ^b	$p < 0.001$
2. John F. Kennedy	3.39	3.81	$p < 0.10$
3. Malcolm X	1.49 ^c	3.40	$p < 0.001$
4. Martin Luther King	2.88	4.34	$p < 0.001$
5. Robert F. Kennedy	3.08	3.56	$p < 0.10$
6. Ted Kennedy	2.07	2.16	
7. George Wallace	1.75	2.23	$p < 0.10$
8. Gerald Ford	1.88	1.63	
9. Gen. Francisco Franco	1.55	1.29	
10. A personal, unexpected shock	3.68 ^c	4.22 ^d	

^aFour informants failed to complete this item.

^bOne informant failed to complete this item.

^cThree informants failed to complete this item.

^dSeven informants failed to complete this item.

In Table 3 we have arrayed the mean consequentiality scores assigned each event by the total groups of Blacks and Whites. Let us look first at what

does not take us by surprise. The mean consequentiality scores for the civil rights leaders, Medgar Evers, Malcolm X and Martin Luther King, are all very significant and, as anticipated, their consequentiality is greater for Blacks. George Wallace's consequentiality is also greater for Blacks, but at a borderline level of significance. The simplest way, then, to read Table 3 is to say that it provides independent validation of our obvious-enough notion that just these men had greater biological significance or consequentiality for Blacks than for Whites. Since the notions are obvious, one may also say that the results provide a degree of validation for the consequentiality scale. There is firmer validation in the fact that Whites gave a higher consequentiality score to their personal shocks than to any events on the national level, and Blacks rated only the consequentiality of the death of Martin Luther King above their personal shocks.

If we are going to take seriously the difference in consequentiality, for Blacks and Whites, of George Wallace, then we must do the same for the differences with regard to John Kennedy and Robert Kennedy because the significance values are approximately the same. We failed to predict that Blacks would find the deaths of John and Robert Kennedy more consequential than Whites did only because we did not go beyond the level of those intuitions that are most obvious. We ought to have anticipated differences of about the order we see in Table 3. Robert Kennedy was, perhaps, more outspokenly concerned, in both words and actions, about the civil rights of Blacks than was his elder brother, and we still remember how numerous were the Blacks in the crowds that lined the tracks of his funeral route. But we suspect that Blacks felt the deaths of John and Robert Kennedy to be more consequential than Whites did, not just because of explicit policy statements and actions of the Attorney General's office. Both men, one as a president and the other as a likely president, succeeded in engendering in the nation as a whole a hope that its ideals would be realized. One of those ideals has always been equality. Whites were accustomed to be counted in. But this time many Blacks felt that the Kennedys meant them too.

Evidence for the Full Conception

In the results reported above we were able to include all informants, but not all variables. In the data now to be reported we can include all of the variables that play a role, in our opinion, in the creation of FB accounts. We cannot, however, include all informants. There can be no rehearsals where there are no FB accounts and, likewise, no elaboration to count in canonical content units and no length to count in words. In short, we are limited to just those informants who wrote FB accounts for each of the 10 events. And

the range across events in number of FBs we already know to be great. In fact, it is from 39 Whites and 40 Blacks for John Kennedy to no Whites at all for Medgar Evers. The full data for Whites appear in Table 4 and for Blacks in Table 5.

Table 4. *Mean consequentiality, percentage of overt rehearsals greater than zero, and mean lengths of accounts for Whites with FBs**

Event	Consequentiality	Rehearsals > 0	Account length in content units	Length in words
1. Personal shock (N = 37)	3.68	— ^a	5.57	76.54
2. John F. Kennedy (N = 39)	3.37	73%	4.44	95.33
3. Robert F. Kennedy (N = 25)	3.04	52%	2.96	54.00
4. Martin Luther King (N = 13)	3.00	54%	2.85	56.69
5. Ted Kennedy (N = 13)	1.90	31%	2.23	35.15
6. Gerald Ford (N = 23)	1.83	35%	2.61	31.56
7. Gen. Francisco Franco (N = 17)	1.53	a	2.65	28.76
8. George Wallace (N = 11)	1.36	9%	2.64	37.58
9. Malcolm X (N = 1)	1.00	0%	2.00	34.00
10. Medgar Evers (N = 0)	—	—	—	—

*Events are not ordered chronologically, but by consequentiality scores, from high to low.

^aBy mistake, informants were not asked about overt rehearsals.

Setting aside the critical level of surprise, which we are assuming to be satisfied by all events, the flow chart of Figure 1 that eventuates in a FB account begins as a consequentiality score. To preserve the left-to-right sequence of Figure 1, the events in Tables 4 and 5 are ordered by mean consequentiality score from high to low whereas they have heretofore been ordered chronologically. Tables 4 and 5 are included, essentially, because we think the best thing to do in the case of incomplete data is to report the data in full. In addition, however, we think the most nearly appropriate statistic should be used, and for these data that statistic is Spearman's rank order correlation coefficient (ρ).

All of the ρ s relevant to the conception of Figure 1 appear as Table 6. The discussion of the results reported in full in Tables 4 and 5 is much more easily coordinated with Table 6. It is necessary to remember that the number of informants on which the values constituting the rank orders vary, and that is not ideal. However, we have done what we could to minimize the un-

Table 5. *Mean consequentiality, percentage of overt rehearsals greater than zero, and mean lengths of accounts for Blacks with FBs**

Event	Consequentiality	Rehearsals > 0	Account length in content units	Length in words
1. Martin Luther King (N = 30)	4.43	60%	3.27	52.93
2. Personal shock (N = 32)	4.19 ^b	— ^a	5.16	64.81
3. Malcolm X (N = 14)	3.86	29%	2.36	37.29
4. John F. Kennedy (N = 40)	3.81	90%	3.83	78.47
5. Robert F. Kennedy (N = 20)	3.76	50%	3.00	47.55
6. Medgar Evers (N = 5)	3.60	20%	1.60	17.40
7. George Wallace (N = 20)	2.55	30%	2.45	25.95
8. Ted Kennedy (N = 10)	2.20	40%	2.20	27.10
9. Gerald Ford (N = 16)	1.91	19%	1.88	16.31
10. Gen. Francisco Franco (N = 13)	1.15	— ^a	2.08	22.23

*Events are not ordered chronologically, but by consequentiality scores, from high to low.

^aBy mistake, informants were not asked about overt rehearsals.

^bOne informant failed to complete this item.

Table 6. *Spearman rank correlation coefficients for certain pairs of 7 variables*

	Whites	Exact <i>p</i>	Blacks	Exact <i>p</i>
Consequentiality; Overt rehearsals > 0	0.886 (N = 6)	0.017	0.536 (N = 7)	0.118
Consequentiality; Content categories	0.786 (N = 8)	0.014	0.883 (N = 9)	0.0015
Consequentiality; Length in words	0.810 (N = 8)	0.011	0.883 (N = 9)	0.0015
Overt rehearsals > 0; Content categories	0.771 (N = 6)	0.051	0.893 (N = 7)	0.0062
Overt rehearsals > 0; Length in words	0.771 (N = 6)	0.051	0.893 (N = 7)	0.0062
Content categories; Length in words	0.786 (N = 8)	0.014	0.933 (N = 9)	0.00037

reliability resultant from a small number of informants without eliminating so many values as to make computation of rhos meaningless. The rule we have followed is simple: for any pair of columns in Tables 4 and 5, use all available values *providing the value is based on at least 10 informants*.

We will take up the conception pictured in Figure 1 at the second level, the consequentiality rating, which is our translation into a continuous

variable of Livingston's biological significance. We have proposed that higher consequentiality values make for more elaborate FB memories, but the memory itself, of course, is inaccessible, and so we cannot directly check that prediction. We also predicted, however, that high levels of consequentiality would compel high frequencies of rehearsal, both covert and overt. We have no data on covert rehearsals, but we do have data on overt rehearsals.

As can be seen in Table 6, the rho between consequentiality and overt rehearsals for Whites is so high (0.886) that even with an N of only 6 it is significant. The value for Blacks is positive and moderately high, but with an N of 7 not significant. If a *post hoc* suggestion is not out of order, we have a notion why the value was as low as this. Blacks may have felt a kind of racial obligation to rank Martin Luther King and Malcolm X above any white man; the word *consequentiality* has, after all, some semantic overlap with *importance*. But with respect to rehearsals, Blacks give their highest value to John Kennedy (90% > 0 rehearsals) even as did Whites. It is difficult to imagine any participant in the American culture at that time doing otherwise.

We have suggested that the kind of cue most frequently eliciting overt rehearsals in the past would probably be similar to the cues by which we attempted to retrieve FB memories. We have also suggested that consequentiality should vary directly with the elaboration of a neurological memory and that rehearsals, while drawing on the materials of the memory, would also have a constructive role in building up verbal narratives from the memories. It follows that the consequentiality value of an event ought to be positively related to the degree of elaboration and length in words of a retrieved account by virtue of the mediating rehearsal process. We have then a whole set of predictions.

Consequentiality should be positively correlated with the elaboration of an account in canonical categories. It is (rhos are 0.786 and 0.883). Consequentiality should be positively correlated with account length in words. It is (rhos are 0.810 and 0.883). Rehearsals, as the mediating variable between FB memories and FB accounts, should be related to both the content elaboration and word length values of accounts; rhos are, respectively, 0.771 and 0.771 for Whites and 0.893 and 0.893 for Blacks.

Finally, of course, some positive correlation between content measures of elaboration and word counts of length is to be expected, but obtained values as high as 0.786 and 0.933 is hardly an *a priori* necessity. The content coding into 6 categories for historical events and 9 for personal shocks is to be compared with a range in word counts from 6 to 343. If the so-called canonical categories were not close to the essence of the degree of elaboration in the neurological memories, we might find that long accounts did not necessarily

include most or all of the canon but were often exhausted on irrelevant matters such as the weather, one's clothing, one's most recent meal, one's favorite novel, or what have you, with the canon omitted. At the same time, the canon is so small that, in principle, very few words could cover the lot. The suggestion is that Place, Ongoing Activity, Informant and so on are, in fact, the uniform terms in which the event was experienced, that they well represent the regnant brain processes at the time of the event.

Discussion

You have now seen all the quantitative data we have that are relevant to our behavioral version of Livingston's "Now print!" theory. We should like now to remind you of a qualitative aspect of our data that makes a "Now print!" theory especially appealing to us. Livingston states that the "Now Print!" order, activated by some surprising and biologically significant event, affects all immediately preceding as well as contemporaneous brain patterns. This proposition is exactly what is required to explain two aspects of the accounts written by our informants: (1) certain content categories were so frequently present in the accounts that we have called them canonical; (2) many accounts included utterly idiosyncratic and, in a sense, accidental content.

The canonical categories that appeared most often were: Place, Ongoing Activity, Informant, Own Affect, Other Affect, and Aftermath. If one thinks of the situation of the individual person when someone breaks in upon him with the startling news of an assassination or the like, it is evident that the brain activity roughly contemporaneous must usually be just the sort of nervous activity required to satisfy the canonical categories. Remember that it is not memory for the central newsworthy event that constitutes a FB memory, but rather memory for the *circumstances* in which one first heard the news. And Livingston's proposal that contemporaneous brain activity will result in permanent neurological change is precisely what is needed to explain this curious phenomenon.

Each individual, when he is broken in upon with startling news, may not only be attending to usual matters like Place and Ongoing Activities, but to quite irrelevant, accidental matters. Attention is not always fully task governed, so one person remembers the color of a dress, another something of the character of the informant, another the name of a companion. One psychologist and former Harvard colleague (not an informant in the study) included, in his account of his memory for the news of the shooting of President Kennedy, that he was walking up the steps of Emerson Hall and could still feel the special rubber tread on those steps at that time. Com-

parable idiosyncrasies appear in many of our accounts, and they are just what should appear if all ongoing brain patterns are subject to the order "Now print!"

To some readers it must seem that our conceptualizing as "biological significance" the variable that, with surprise and rehearsals, is conceived to be most important in the creation of FB memories is distinctly under-motivated and possibly no more than conformity to a current fad for biological explanations in psychological science. Clearly, there is, in this case, no direct way to measure biological significance. We have had to resort to common-sense reasoning about racial groups and to a scale of consequentiality. We cannot, certainly, prove that biological significance is the best conceptualization. Perhaps it should be prominence or emotional cathexis or extremity of attitude or degree of arousal or some other concept, overlapping in sense with consequentiality, but partially independent. Perhaps whenever attention is sustained at some high level, beyond some critical time, a FB memory is created.

Concepts such as we have described, as well as any serious neurological proposals that may develop, are not really in competition with biological significance. They operate on several different levels of explanation. With the neurological process constituting a test for biological significance unknown, the problem is to find a question, a scale, an evoked potential, a peripheral indicant of attention, or something else that will closely reflect the unknown brain event. If the brain event were known and could be measured, it would be possible to predict and create FB memories with a high level of precision. The question would then be whether the identified brain event were such as to have biological significance in Livingston's sense. What that reduces to is the question whether the mechanism has a significant innate component which the species might reasonably be supposed to have evolved in accordance with the Doctrine of Natural Selection. An innate component, of course, does not mean a mechanism that can develop without specific experiential inputs. In the end, our liking for biological significance is based on a belief that the relevant mechanism does have an important innate base and that a plausible, even interesting, case can be developed for its evolution in accordance with natural selection.

There is, in the name Livingston has given to his theory, a wonderful and revealing paradox which he, himself, does not seem to have noticed. The theory is named "Now print!" and it is the nervous system that is supposed, metaphorically, to print. But in fact, of course, printing is done by presses and for newspapers and books. *What* they print is the central newsworthy event, the assassination or its like. There is no actual need for the human nervous system today to print, or remember, on the basis of one trial, major

political assassinations. They are all in the printed record; they are a part of history. One can look them up if there is ever any doubt, but there never is, because one reads references to them many times. No special nervous mechanism is today required for events like this.

What is not anywhere printed is the individual circumstances in which each person first receives the news. Each is, in the concrete, unique and not newsworthy. They cannot be looked up in any book or paper. If they are not remembered, they are lost. But, then, what of that? What need is there today to remember them?

The “Now print!” neurobiological mechanism surely did not evolve in the human species in historical time, that is, in the few thousand years since writing was invented or the few hundred since printing was invented. The mechanism surely evolved much earlier in the (roughly) one million years since our species appeared. At the time when the mechanism evolved, there was no *actual* printing; there was only the human memory. What surely had to be printed neurologically and put in permanent store was not the circumstances of an unexpected and biologically significant event, but the event itself. To survive and leave progeny, the individual human had to keep his expectations of significant events up to date and close to reality. A marked departure from the ordinary in a consequential domain would leave him unprepared to respond adequately and endanger his survival. The “Now print!” mechanism must have evolved because of the selection value of permanently retaining biologically crucial, but unexpected events. It seems to be an irony of evolution that it is just the central newsworthy events that no longer need to be retained because cultural devices have taken over the job. And today the automatic recording of the circumstances, concomitant to the main event, is what captures our interest and calls for explanation.

But the explanation has not been given. Certainly the surprising and consequential had to be permanently remembered, but why should man *ever* have developed a mechanism for storing his concomitant circumstances? When – ever – would such memories have had survival value?

Suppose we imagine a state of life for primitive man. We are not now at a time when presidential assassinations are the critical events to evoke. They would be something more like the appearance in one’s territory of a new dangerous carnivore or the sight of a serious injury to a dominant male of the same species or the moving on, of a troop of baboons, to a new and remote range. These things have to be stored in memory promptly and enduringly and are most closely similar to the Person and Event categories which in our Personal Shock cases were *never*, literally never, omitted from the account. What might the concomitant circumstances have been like, and would there have been any reason to remember them?

Place, after all, is important almost always. Where was the primitive man when he saw the new carnivore or the baboon troop on the march? The significance of the main event is, in great degree, defined by its locus. Nothing is always to be feared or always to be welcomed. It depends. In part on place. What about ongoing activity? Well, perhaps it is the nature of that activity that has attracted an animal or enraged him or allowed him to draw near without being noticed. Affect in others may well be a clue from more experienced conspecifics of the character of an intruder or the quality of some prey or some sheltering space. So, it is not really difficult to conceive of reasons for permanently remembering the circumstances in which something novel and consequential occurred. But we have not yet quite unraveled the mystery of these memories.

The canonical category called "Informant" was the category most often specified in FB accounts and, in that fact, we find the reason why these enduring memories for personal circumstances struck us as mysterious in the first place. All of the 10 events we used to search for FB memories were events like John Kennedy's assassination in which there was a sharp separation between the time and place of the significant event and the circumstances in which each of many millions first heard of that event. An informant was essential for all who were not on the scene, and that informant was usually radio or television. Primitive man, lacking such instruments of telecommunication, would not so regularly register an informant. Sometimes, of course, he would, at least for separations of moderate length since spoken and gestural language may be as old as the species.

But what if there were no informant, then or now, no separation between the event and the circumstances in which one learned of it? You are in a startling and serious automobile accident, or you narrowly miss being struck by lightning. There is novelty and biological significance, and also a FB memory. But what now are the preceding and concomitant circumstances? Still, perhaps, Place and maybe Time and Ongoing Activity and Affect with only Informant missing. But what a difference it makes! The place of an automobile accident, the ongoing activity, the affect are no longer circumstances attendant upon hearing the news. In a way, they *are* the news, at least parts of it or dimensions of it. The precise intersection, the make of the car, the signal unobserved all together define the event. And so it makes sense that all of these brain patterns should have to be permanently stored and that a "Now print!" mechanism for doing it would have evolved. What is relatively new is telecommunication which makes an informant a necessity and creates the sharp separation between news and circumstances of hearing the news, and that is what first made us think we were on the trail of a mystery. Probably the same "Now print!" mechanism accounts both for

the enduring significant memories in which one has played the role of protagonist and those in which one has only been a member of an interested audience of millions.

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Résumé

Le souvenir "éclair" (Flashbulb Memory) est le souvenir des circonstances dans lesquelles on a appris, pour la première fois, un événement très surprenant aux conséquences importantes (ou éveillant une grande émotion). Le cas prototype est la nouvelle de l'assassinat du Président John Kennedy. Presque tout le monde se souvient, avec une grande acuité perceptive, où il se trouvait au moment où il a appris la nouvelle, ce qu'il faisait, qui la lui a apprise, ce qu'il a ressenti à son propos et les suites immédiates de l'événement. De même, on se souvient d'un ou parfois de plusieurs faits concomitants, totalement idiosyncratiques et parfois triviaux. L'article présente un questionnaire portant sur les déterminants de ce type de souvenir, à propos d'autres assassinats, événements d'importance mondiale et significatifs du point de vue personnel. Si l'assassinat de John Kennedy a créé un souvenir "éclair" extraordinairement puissant, ce n'est pas le seul événement à avoir créé ce type de souvenir.

Les deux principaux déterminants semblent être le niveau de surprise élevé et le niveau des conséquences impliquées ou peut être l'éveil émotionnel (évalués par échelles de cotations et appartenance à un groupe ethnique). Si les deux variables n'atteignent pas un niveau suffisant, il n'y a pas souvenir "éclair". Si le niveau est suffisant, ces deux variables affectent directement la fréquence du rappel (implicite ou explicite) qui affecte, à son tour, le degré d'élaboration du récit, expérimentalement obtenu.

On propose de mettre en parallèle, de manière explicite, la théorie du comportement et la théorie neuro-physiologique, moins élaborée et spéculative de R. B. Livingston (1967). Enfin, la discussion porte sur une mémoire permanente des faits incidentels concomitants, à un événement surprenant (au sens de biologiquement significatif) qui aurait une grande valeur sélective et pourrait expliquer l'évolution d'une base innée pour un tel mécanisme de mémoire.