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2

Illusions of Knowing: The Link between Knowledge and Metaknowledge

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One puzzling observation about metacognition is that people are generally accurate in monitoring their knowledge. The present chapter focuses on the feeling of knowing (FOK) often experienced when people fail to retrieve a solicited target from memory. It is argued that the FOK *doss* not monitor directly the underlying memory trace, but is based on the overall amount of partial information accessed about the target, and on the ease with which it comes to mind. Evidence from conditions that precipitate an illusion of knowing, i.e. a strong FOK which turns out to be unwarranted, supports these assumptions. This evidence suggests that the accuracy of metaknowledge derives from the accuracy of knowledge itself, and that illusions of knowing occur when the accessibility of information is not diagnostic of its accuracy.

Monitoring and control processes in memory

Most cognitive processes are normally accompanied by metacognitive operations that supervise and control various aspects of these processes. Thus, when we make an appointment, we often have to take precautions not to miss it, and these precautions depend on our assessment of their effectiveness as well as on our assessment of the chances of missing the appointment if these precautions are not taken. After performing a planned action (e.g. locking the door) we may wonder whether we have done so, and if we are not sure, we may go back to double-check. When we learn a new text, we normally monitor our comprehension of the material, and can generally monitor the future recallability of the acquired information. In attempting to retrieve a piece of information from memory, we can often tell whether it is indeed in store and worth searching for, and when we finally do succeed in retrieving the solicited information, we can generally assess the likelihood that it is the correct information.

What is important about the subjective feelings that ensue from monitoring operations is that they generally have measurable effects on our behavior (see Koriat & Goldsmith, 1996b; Nelson & Narens, 1994). For example, the stronger my feeling of knowing about an elusive name, the more time I am likely to spend searching for it before giving up (e.g. Costermans, Lories, & Ansay, 1992; Gruneberg, Monks, & Sykes, 1977; Nelson & Leonesio, 1988; Nelson & Narens, 1990). The urge to bring the search to an end is all the more intense when 1 feel that the name is on the "lip of the tongue" and is about to emerge into consciousness (Brown, 1991; Brown & McNeill, 1966).

The accuracy of (he subjective monitoring of knowledge

In view of the possible causal role played by metacognitive judgments, it is important to inquire into their dependability. Curiously, divergent views can be discerned in the literature regarding people's ability to monitor their knowledge. For example, there are those, particularly in the area of judgment and decision, who seem to take this ability for granted, focusing on explaining systematic deviations from perfect accuracy (e.g. Lichtenstein, Fischhoff, & Phillips, 1982; see Juslin, 1994; Koriat, Lichtenstein & Fischhoff, 1980). Thus, a great deal of evidence has accumulated, testifying to people's tendency to be overconfident in the correctness of their knowledge. Others still, particularly in social psychology, have stressed the general fallibility of metacognitive judgments. Ross (1997), for example, emphasized the problems involved in validating one's own memories. Nisbett and his associates (Nisbett & Bellows, 1977; Nisbett & Wilson, 1977) went as far as claiming that people have little direct introspective access to the actual determinants of their behavior: When asked to report on the reasons for their behavior, people simply report those reasons that according to their a priori theory constitute plausible determinants of their behavior.

A similar view has been emerging among cognitive psychologists as a result of the upsurge of research on implicit information processing. This research has yielded many demonstrations indicating that knowledge and metaknowledge may be dissociated (Umilta & Moscovitch, 1994). Jacoby and his associates, in particular, have elaborated on the implications of these dissociations for engendering illusions of memory (sec Jacoby and Whitehouse, 1989; Whittlesea, Jacoby, & Girard, 1990).

Traditionally, however, there has been a common belief among cognitive psychologists that as far as explicit knowledge is concerned, there is a general correspondence between subjective and objective indices of knowing: People are able to monitor their knowledge. This ability, however, has generally been treated as something of a mystery. Consider, for example, the following characterization of the tip-of-the-tongue (TOT) state by William James:

> Suppose we try to recall a forgotten name. The slate of our consciousness is peculiar. There is a gap therein; hut no mere gap. It is a gap that is intensely active. A sort of wraith of the name is in it, beckoning us in a given direction, making us at moments tingle with the sense of our closeness and then letting it sink back without the longed-for term. If wrong names are proposed to us, this singularly definite gap acts immediately so as to negate them. They do not fit into

> its mould. And the gap of one word does not feel like the gap of another, all empty of content as both might seem necessarily to be when described as gaps (1893, p. 251)

This phenomenological description implies that there is something unique about the subjective monitoring of one's memory. A similar attitude is disclosed by Tulving and Madigan's (1970) of-cited review of the verbal learning literature:

> Why not start looking for ways of experimentally studying, and incorporating into theories and models of memory, one of the truly unique characteristics of human memory: its knowledge of its own knowledge. No extant conceptualization . . . makes provisions for the fact that the human memory system cannot only produce a learned response to an appropriate stimulus or retrieve a stored image, but it can also rather accurately estimate the likelihood of its success in doing it (p. 477)

It is clear that both of the excerpts cited above take for granted the validity of TOT and feeling-of-knowing (FOK; judgments. What is mysterious is not that people experience FOK and TOT states, but that these subjective states are diagnostic of actual knowledge. Indeed much of the work since Brown and McNeill's (1966) classic study of the TOT, and Hart's pioneering studies of the FOK (Hart, 1965, 1967a, I967b) has attempted to establish the validity of subjective judgments of knowledge.

Furthermore, both of these excerpts imply that there is something special about the subjective monitoring of knowledge. As Tulving and Madigan stressed, this monitoring represents "the most important and the least understood aspect of human memory." The implicit assumption is that both the prediction of recall imminence that occurs in the TOT state, and the prediction of recognition performance that occur.; in the FOK state are not intellectual judgments like those possibly underlying the assessment that a certain candidate is likely to win the election, or that it will rain the next day. The latter judgments are generally based on an educated inference that takes into account a variety of considerations. Instead, the TOT and the FOK states are seen to involve a direct, unmediated ***feeling*** that the target is in the memory store and is about to emerge into consciousness. Perhaps, then, the subjective monitoring of knowledge is based on some *special module* that allows the person to monitor directly the availability in the memory store of a target that is not accessible. Such direct access to the underlying memory trace may explain why people can sometimes have a strong feeling that they "know" the answer to a question even when they are unable to retrieve it.

The idea of a specialized monitoring module

The idea that the FOK is based on direct access to memory traces has been incorporated into a model of the FOK put forward by Hart (1965, I967a, 1967b), and implicitly endorsed in many discussions since (see, e.g. Yaniv &

Meyer, 1987). Hart's model postulates the existence of a special monitoring module that has privileged access to memory traces, and can detect the *availability* in the memory store of an otherwise inaccessible target. Thus, whenever a person is required to recall a target, the monitoring module is activated to make sure that the target is present in memory before the attempt is made to retrieve it.

The assumption of the trace-access model that FOK judgments occur at a pre-retrieval stage implies that monitoring is independent of retrieval. Indeed, according to Hart, the functional value of having a built-in monitoring module derives precisely from the fact that such a module can inform us whether the solicited target is stored in memory *before* we attempt to search for it. In that way we can save the effort of searching for something that is not there.

The assumption that monitoring precedes retrieval is also shared by proponents of the cue-familiarity account of the FOK. According to this account, the FOK monitors the mere familiarity of the question, not the retrievability of the answer. Thus, Reder (1987; Reder & Ritter, 1992), for example, observed that the time for making FOK judgments about the recallability of an answer was faster than that of retrieving the answer itself, suggesting that the FOK could not rely on the output of retrieval.

Another assumption underlying the trace-access model is that FOK judgments monitor the availability of the *correct* target in store, even when incorrect targets are retrieved, or when the partial information accessed during retrieval actually sterns from an *incorrect* target (see Koriat, 1994). In fact, this assumption has guided some of the experimental practices in the study of the FOK, for example the practice to solicit FOK judgments both when subjects fail to retrieve any answer (omission error) and when they retrieve what the experimenter considers to be a wrong answer (commission error). Thus, even though a subject may insist that the capital of California is San Francisco, the experimenter still asks for FOK judgments, because such judgments are implicitly assumed to monitor the trace of the *correct* target (see Koriat, 1993). In sum, the trace-access model assumes that the FOK has privileged access to information that is beyond the reach of retrieval.

An elegant feature of this model is that it also offers a straightforward explanation for the accuracy of the FOK, because the FOK is assumed to directly monitor the presence of the trace in memory. In fact, the implicit endorsement of the trace-access model is sometimes disclosed by the researcher's focus on the question of why FOK judgments are *not* perfectly correlated with actual memory performance.

The accessibility account of the feeling-of-knowing

The accessibility account that I have proposed (Koriat, 1993, 1994, 1995), challenges the assumptions of the trace-access model. According to this account, there is no separate monitoring module that has privileged access

to information that is not already contained in the output of retrieval. Rather, the cues for the FOK reside in the products of the retrieval process itself. Whenever we search our memory for a name or a word, many clues often come to mind (Brown, 1991; Gardiner, Craik, & Bleasdale, 1973; Lovelace, 1987; Read & Bruce, 1982), including fragmenls of the target, semantic attributes, episodic information, and a variety of activations emanating from other sources. Such clues are often not articulate enough to support an analytic inference, but can still give rise to the subjective feeling that the target is available in memory and will be recalled at some later time. Thus, FOK monitors the overall *accessibility* of partial information pertaining to the target, primarily the amount of information retrieved and its ease of access. Importantly, it is assumed that people cannot directly monitor the accuracy of the retrieved partial clues. Therefore, both correct and incorrect clues contribute to the enhancement of the FOK.

According to this view, then, monitoring does not precede retrieval but follows it: It is by attempting to retrieve a target from memory that one knows whether the solicited target is "there" or not. Therefore if retrieval goes wrong, so will monitoring. In fact, retrieval may be fooled by a variety of clues deriving from many sources, such as neighboring targets, priming, misleading postevent information, and so on. In that case monitoring too will go wrong.

Explaining the accuracy and inaccuracy of the feeling-of-knowing

The major problem with the accessibility account, of course, concerns the explanation of the *accuracy* of the FOK: If the FOK monitors the overall accessibility of information regardless of whether it is correct or wrong, why is it nevertheless quite accurate in predicting actual memory performance? After all it is because of its validity in predicting actual performance that the FOK has attracted so much attention among students of memory.

The answer to this question derives from a basic postulate of the accessibility account: The accuracy of metamemory stems directly from the accuracy of memory itself. To clarify this point, it is necessary to distinguish between input-bound and output-bound measures of memory performance (see Koriat & Goldsmith, 1994, 1996a, 1996b). For example, suppose a person is presented with 100 words, and remembers 27 words. His input-bound performance, reflecting the percentage of words remembered out of the number of input words is only 27%. However, what matters for FOK accuracy is the output-bound performance, i.e. the percentage of correct words out of those reported by the person. This is generally much higher than the input-bound measure. For example, the person might make three commission errors in addition to the 27 correct words, in which case his output-bound accuracy will amount to *90%*. Indeed, in free-recall tests, most of the items that a person reports are correct, and only a few constitute extra-list intrusions. The same is true with regard to partial recall:

When a person fails to retrieve the full target, most of the partial clues that he does access are correct (see Koriat, 1993).

In sum, what matters for the accuracy of subjective monitoring of knowledge is the output-bound accuracy of what comes to mind. This is generally very high. Of course, a memory question may fail to precipitate any information at all, but if it does activate a complete or partial recall, that recall stands a better chance of being correct than of being wrong. Therefore a monitoring mechanism that is based solely on the accessibility of information, as such, is bound to be predictive of actual recall and recognition performance (see also Lories, 1994).

Some evidence in support of the accessibility model of the feeling-of-knowing

Some support for the accessibility account comes from a series of studies using episodic memory for artificial stimuli. In one experiment (Koriat, 1993, Experiment 1) subjects studied a four-letter nonsense string on each trial (e.g. *BKRN),* and following a filler task, they were asked to recall the full target or as many letters as they could remember from it. Then they indicated their FOK judgments about the probability of recognizing the target among distractors, and their recognition memory for the target was finally tested.

The results disclosed the following pattern: FOK judgments increased systematically and significantly as a function of the amount of correct partial information accessed, that is, the number of correct letters retrieved. However, these judgments also increased significantly and systematically with the amount of *incorrect* partial information accessed, that is, the number of incorrect letters reported. Thus, both correct and wrong partial information seemed to contribute to the enhancement of the FOK. Recognition memory, on the other hand, disclosed a different pattern: The likelihood of correct target recognition increased with the amount of correct partial information, but decreased with the amount of incorrect partial information accessed. This pattern of results suggests that correct partial information contributes to the accuracy of FOK in predicting recognition performance, whereas incorrect partial information contributes to its inaccuracy, fostering an illusion of knowing.

Nevertheless, despite the conflicting contributions of correct and wrong partial recalls to the validity of the FOK, the overall correlation between the FOK and recognition was positive and high. Why was that so? The reason is simply that the partial information accessed was correct by and large: The output-bound accuracy of a reported letter was 0.9, i.e. 90% of all reported letters were correct. Therefore even though subjects could not monitor directly the accuracy of the information retrieved, the total amount of information retrieved could serve as a sufficiently good predictor of recognition memory.

In sum, these results indicate that by focusing on the wrong information that comes to mind we can unravel the connection between knowledge and metaknowledge. Although subjects are generally successful in monitoring the availability of inaccessible information, this is not because they have privileged access to the underlying memory trace. Rather, the FOK monitors the accessibility of partial information regardless of its correctness, and its accuracy derives from the fact that most of the information that comes to mind is correct. In this sense the accuracy of metamemory can be said to constitute a by-product of the accuracy of memory itself.

These ideas are illustrated by the following observation: In the experiment just described, subjects' FOK judgments were found to have no greater predictive validity than the mere amount of information retrieved. Thus, the within-subject correlation between number of letters recalled (regardless of their correctness) and recognition memory was 0.58, which is about the same as the correlation between FOK and recognition: 0,55. A similar pattern was observed in another experiment (Koriat, 1993, Experiment 2), the respective correlations being 0.56 and 0.47. Thus, FOK judgments do not appear to have privileged access to information that is not already contained in the output of the retrieval attempt.

Additional cues for the FOK: ease of access

The amount of information accessed about a nonrecallable target represents only one aspect of accessibility, possibly the most influential determinant of the FOK. The other aspect is the *intensity* of the information retrieved, e.g. the case with which the information comes to mind, its vividness, specificity or persistence. Indeed, the results of one experiment that focused on ease of access (Koriat, 1993, Experiment 2) suggested that this cue makes a contribution to FOK over and above that of the amount of partial information retrieved. The procedure was the same as that described above except that the latency of initiating recall of the string or part thereof was also measured, and was used as an index of ease of access.

The results disclosed three findings. First, correct information was retrieved with shorter latency than incorrect information even when the number of letters recalled was held constant. Thus, ease of access is diagnostic of the accuracy of the information retrieved. Second, ease of access appeared to affect FOK judgments independent of the amount of information retrieved (see also Costermans et al., 1992; Nelson & Narens, 1990). Finally, FOK judgments were diagnostic not only of the likelihood of recognizing the correct target, but also of the accuracy of the partial information retrieved.

These results suggest that the ease with which information comes to mind can serve as a valid cue for the accuracy of that information, and that FOK judgments do in fact monitor ease of access. The reliance on ease of access, then, can also contribute to FOK validity in predicting memory performance. In this manner FOK judgments can function in two capacities, as

predictors of the future recognition of the full target (prospective monitoring), and as postdictors of the accuracy of the partial information that has already been accessed (retrospective monitoring).

Dissociations between knowledge and metaknowledge

Because the feeling of knowing is assumed to rely on the mere accessibility of information, systematic differences may be expected between predicted and actual memory performance. Indeed in an earlier study we demonstrated that knowledge and metaknowledge can be dissociated. In that study we examined in detail the nature of memory pointers that contribute to the accuracy and inaccuracy of the FOK (Koriat & Lieblich, 1977). A "memory pointer" was defined as any cue that is intended to specify a particular memory entry, for example a word definition, a general information question calling for a one-word answer (e.g. a name or a concept), or a stimulus word in a paired-associate task. Subjects were presented with word definitions and were asked to signal whether they knew the answer, didn't know it, or were in a TOT state. Then they were asked to recall the target or produce partial information about it. The data allowed us to classify the responses into nine "memory states," such as "Know - Incorrect" (the subject announces that he knows the answer, but provides an incorrect answer), "TOT - Got it - Correct" (the subject announces that the target is on the tip-of-the-tongue, but before the trial is over he succeeds in retrieving the correct answer). An analysis of the memory pointers in terms of the likelihood of precipitating each of these memory states indicated that they differ reliably along two dimensions: (a) the likelihood of eliciting or suggesting the correct target ("knowledge"), and (b) the likelihood of precipitating a FOK or a TOT state ("metaknowledge"). Importantly, these two dimensions were *orthogonal*, suggesting that the properties of pointers that give rise to a strong FOK are not the same as those that contribute to the retrieval or recognition of the correct target. Thus, for example, some pointers consistently produced a strong feeling of knowing that proved unjustified. Other pointers, on the other hand, led to relatively accurate metacognitive judgments. For these pointers subjective and objective indices of knowing were in general agreement.

These results suggest that perhaps some insight into the determinants of the FOK and its accuracy could be gained by investigating the nature of different memory pointers. Furthermore, they seem to indicate that different memory properties are responsible for the FOK than those responsible for its accuracy. Indeed a recent study carried out within the framework of the accessibility model (Koriat, 1995) explored these ideas, and also provided some clues regarding the conditions that produce a dissociation between knowledge and metaknowledge.

That study distinguished between properties of pointers that are pertinent to the FOK and those that are pertinent to its accuracy in predicting actual

memory performance. As far as the *determinants of the FOK* are concerned, it was proposed that pointers which bring to mind many clues should result in a stronger FOK than those eliciting only a few clues regardless of whether these clues are valid or not. A simple index of the amount of accessible information elicited by a pointer is the percentage of subjects who produce an answer to that pointer in recall, regardless of whether the answer is correct or wrong. This was called the accessibility index (ACC). The hypothesis is that high ACC pointers will result in relatively high FOK judgments even among subjects who fail to recall any answer. This is because such pointers are assumed to leave behind a large number of clues when recall fails.

What should determine the *accuracy of FOK Judgments?!* This is assumed to depend on the correctness of the clues that come to mind. When these clues are predominantly correct, FOK will be a valid predictor of actual memory performance. However, if most of the clues that come to mind are incorrect, the pointer should be likely to engender an illusion of knowing, i.e. a strong but unwarranted FOK. The proper index then is what we called output-bound accuracy (OBA; see Koriat & Goldsmith, 1994, 1996b), that is, the percentage of correct answers out of all the answers elicited by a pointer. For example, assume that a pointer (e.g. a general-information question requiring a one-word answer) is presented to 100 subjects, 60 of whom give the correct answer and 15 give a wrong answer. For such a pointer ACC will be 60%, and OBA will be 80%. This pointer is likely to evoke a high FOK even among the 25 subjects who failed to come up with any answer (because of the high ACC), and this FOK is likely to be warranted (because of the high OBA). On the other hand, if the frequencies of correct and incorrect responses are reversed (so that OBA is only 20%), then the pointer should produce an illusion of knowing, i.e. it should evoke an unwarranted high FOK following recall failure. Thus, the assumption is that the critical determinant of FOK accuracy is the conditional probability that an answer that comes to mind is correct.

As noted earlier, memory is generally correct in the sense that information that comes to mind is more likely to be correct than wrong. Hence for the great majority of memory pointers OBA will exceed 50%. Such pointers will be labeled "Consensually Correct" (CC) because they elicit more correct than incorrect answers across subjects. However, there are many atypical pointers which, for one reason or another, elicit more incorrect than correct answers across subjects (i.e. OBA < 50%). These can be called "deceptive" (Fischhoff, Slovic, & Lichtenstein, 1977) or "Consensually Wrong" (CW; Koriat, 1976; see Gruneberg, Smith, & Winfrow, 1973; Nelson, Gerler, & Narens, 1984). One example is the question "What is the capital of Australia?", which lends to elicit Sydney more often than Canberra. Such pointers should be particularly informative regarding the reason for FOK accuracy. If the accuracy of metacognitive judgments derives from the accuracy of memory, then the FOK should be valid for the CC pointers, but not for the CW pointers.

To examine these predictions, a series of general-information questions was compiled which included a heavy representation of deceptive questions. All called for a one-word answer. A typical FOK procedure was used: Subjects attempted lo recall the answer, then they provided FOK judgments, and finally were tested on a four-alternative recognition test.

Consider first the question of the basis of FOK judgments. All questions were divided into a high-ACC and a low-ACC class. In general, FOK judgments were markedly higher when an answer was reported than when no answer was reported, and this was true whether the answer reported was correct or wrong. This finding suggests that the mere accessibility of an answer serves as a potent cue that the person will be able to recognize the *correct* answer among distractors (see Nelson & Narens, 1990). However, high-ACC pointers produced higher FOK judgments than low-ACC pointers even for omission trials, i.e. trials in which the subject failed to reach an answer. Thus, if we consider only those questions for which a given subject could not recall an answer, that subject reported higher FOK judgments for questions that elicited many answers than for those that elicited fewer answers among *other* subjects. Presumably the former questions leave behind a larger amount of partial clues and activations even when recall fails, as was indeed confirmed in a separate experiment (Experiment 3). Importantly, high-ACC pointers evoked higher FOK judgments than low-ACC pointers even among CW pointers, i.e. pointers that elicited mostly incorrect responses. Again, it would seem that the FOK depends on the overall accessibility of partial clues regardless of the correctness of these clues.

Consider next the question of *FOK accuracy.* When only CC pointers were taken into account, FOK accuracy was found to be quite high: The within-subject correlation between FOK judgments and recognition memory was +0.50 (Experiment 1), and +0.31 (Experiment 2). In contrast, for the CW pointers the respective correlations were -0.05 and -0.18. Thus, in Experiment 2, for example, recognition memory for the CW pointers *decreased* significantly as FOK increased: For this class of pointers, the more one feels that one knows the answer, the less likely it is that one actually knows it!

The lesson from deceptive pointers

The somewhat atypical results observed for the deviant CW pointers are quite instructive: Although FOK judgments are generally predictive of actual memory performance (see Schwartz, 1994; Schwartz & Metcalfe, 1994), it is particularly those pointers for which knowledge and metaknowledge are in disagreement that provide insight into the processes underlying the FOK and its accuracy. First, the increase in FOK with increasing ACC was observed for both the CC and CW pointers. This is consistent with the idea that FOK judgments do not have access to the

accuracy of (he information retrieved, but simply monitor the overall accessibility of information regardless of its correctness.

Second, the CC pointers yielded the expected positive correlation between FOK and recognition memory: FOK judgments following recall failure were predictive of recognition memory performance. This result could be seen to support the assumption of the trace-access model that people can directly monitor the contents of their memories. The results with the CW pointers, however, clearly argue against this interpretation. Instead, they suggest that people have no privileged access to information stored in memory beyond that which becomes available as a result of retrieval attempts. Thus, it would seem that the predictive validity of FOK judgments observed for the typical CC pointers derives simply from the fact that these pointers evoke more correct than incorrect clues regarding the inaccessible target.

Finally, the CW pointers produced a strong dissociation between knowledge and metaknowledge that was disclosed by two aspects of the data: First, as noted above, the within-subject correlation between FOKs and actual memory performance was nil or even negative. Second, the level of FOK judgments associated with these pointers was overly inflated when compared to actual memory performance. For example, for a subset of the CW pointers (those eliciting above median FOK) FOK judgments averaged about 90% (i.e. a 0.9 assessed probability of choosing the correct target from among four distractors), whereas recognition performance averaged only about 35%, barely better than chance! It would seeing then, that the illusion of knowing is associated with the accessibility of a large amount of partial clues that contaminate metacognitive judgments. Thus, an examination of the nature of these pointers can throw some light on the conditions that produce a strong illusion of knowing in general (see also Fischhoff et al., 1977; Glenberg, Wilkinson, & Epstein, 1982; Koriat, 1976; Koriat & Lieblich, 1977; Nelson et al., 1984).

Factors contributing to the illusion of knowing

In Experiment 1 of Koriat (1995), 37 memory pointers were identified which elicited more incorrect than correct answers and also produced strong undue FOKs among those who did not recall an answer. What are the characteristics of these pointers that make them induce a strong illusion of knowing? As I have argued, metamemory goes wrong when memory itself goes wrong, so in what sense does memory go wrong in the case of these pointers?

A simple hypothesis is that a pointer that elicits an illusion of knowing is one for which people consensually hold the wrong answer in memory. However, very few of the deceptive pointers conform to this characterization. For example, all of the subjects who produced an incorrect response to the question "What is the capital of Uganda?" mentioned Entebbe (rather than Kampala) as the answer. In this case, it is the incorrect memory entry that possibly serves as the effective target (see Brown & McNeill, 1966), and FOK judgments following a recall failure possibly monitor the partial activations emanating from that target. However, the great majority of CW pointers turned out to evoke more than one incorrect answer across subjects, and in fact, about 50% of them elicited four or more different incorrect answers across subjects (two elicited as many as nine different incorrect answers each!).

Thus, the key to the illusion of knowing must lie not only in the inaccessibility of the correct target, but also in the inflated accessibility of contaminating clues that cannot be readily discredited. This is what distinguishes between two classes of pointers, in both of which the subject does *not* "know" the correct answer (i.e. in both of which the correct target tends to be unavailable or inaccessible): The CW pointers, which apparently evoke a great deal of associations and activations even when recall fails, and the low-accessibility (LA) pointers that leave behind few activations or a "blank" feeling (Koriat, 1995). Compare the following two questions: "In which US state is Yale University located?" and "In which US state is the College of William and Mary located?". Whereas the former tends to produce more incorrect than correct responses among (Israeli) subjects, and to precipitate an unduly strong FOK among subjects who fail to produce an answer, the latter tends to yield no answers at all, and to appropriately evoke a feeling of not knowing.

In comparing the nature of the pointers representing the CW and LA pointers, three general factors emerge which seem to contribute to the inflated accessibility of contaminating information that is associated with the CW pointers. The first is cue familiarity (sec Reder, 1987). Apparently, in order for a pointer to produce a high FOK, it must evoke a sense of familiarity that leads us to interrogate our memory for the answer, and, perhaps explore possible candidates. This exploration increases the overall accessibility of information that is left behind when we fail to find an answer. When the pointer initially leaves us completely blank, we experience a feeling of not knowing even if later on we do succeed in retrieving the target (see Koriat & Lieblich, 1974, 1977).

In fact, several researchers argued that FOK judgments are due primarily to domain familiarity or cue familiarity (see Metcalfe, 1993; Metcalfe, Schwartz, & Joaquim, 1993; Nelson ct al., 1984; Reder, 1987; Nhouyvanisvong & Reder, Chapter 3 in this volume; Reder & Ritter, 1992; Schwartz & Metcalfe, 1992). Thus, it has been argued that the FOK is strictly based on the familiarity of the pointer. Support for this view comes from findings indicating that advance priming of the elements of the pointer can enhance FOK judgments without correspondingly raising the recall or recognition of the answer.

A second factor is that the memory target has many "close neighbors," i.e. targets that roughly satisfy the pointer. Activations emanating from these pointers enhance the FOK regarding the availability of the *correct*

target. It would seem that during the early stages of the search for a solicited target, the FOK monitors the overall accessibility of information from a broad region around the target. The more "populated" that region is, the stronger the FOK. Thus, Koriat and Lieblich (1977) observed that FOK judgments were higher when the solicited word could be readily confused with other alternative words that roughly satisfied the definition. The results suggested that activations from other words in the vicinity of the target affects the FOK even when the subject ultimately succeeds in zeroing in on the correct target.

In fact, in discussing the processes leading to the TOT state, several researchers emphasized the role of neighboring candidate targets. They argued that the TOT state results from the interfering effect of "interlopers" or "blockers" that come to mind when one is attempting to search for the target, and that activations stemming from such compelling but wrong candidates must first be suppressed before the correct target itself can be retrieved (see Brown, 1991; Jones, 1989; Reason & Lucas, 1984). Note that these discussions focus on explaining one aspect of the FOK: the failure to retrieve the target. However, they might also be relevant to the explanation of a second aspect of the TOT: The accompanying subjective conviction that the target is "there" and is about to emerge into consciousness. Tt would seem that the activations emanating from neighboring memory entries exert two conflicting effects: They interfere with accessing the correct target and at the same time enhance the subjective conviction that the target is about to emerge into consciousness (see Koriat, 1994>. These conflicting effects are perhaps one of the reasons for the feelings of frustration accompanying the feeling of knowing (see Smith, 1994).

The foregoing discussion emphasized contaminating activations arising from neighboring targets, but activations from other sources may also enhance the FOK. For example, Koriat and Lieblich (1977) reported findings suggesting that pointers that contain redundant or repetitive information tend to increase the FOK, possibly by enhancing overall accessibility. Also, Brown and Bradley (1985) reported that FOK judgments about the recognition of a state capital are increased by advance exposure to other cities from the same state. As noted earlier, studies conducted in the context of the cue-familiarity account of the FOK (see Chapter 3 in this volume) also indicated that FOK judgments are increased by priming parts of the pointer. Prior exposure to correct or incorrect answers to general information questions has also been found to increase the speed, frequency and confidence with which subjects subsequently gave those answers (Kelley & Lindsay, 1993; sec Nelson & Narens, 1990).

In addition to the factors mentioned above, there is another factor that must be considered in explaining the illusion of knowing: The special difficulties involved in escaping the influence of contaminating activations on the FOK. A great deal of research in both cognitive and social psychology indicates that subjects can often avoid the effect; of irrelevant activations by attributing them to their source. However, they can do so

only under some conditions (see e.g. Bless & Strack, Chapter 6 in this volume; Jacoby & Kelley, 1987; Jacoby, Kelley, Brown, & Jasechko, 1989; Jacoby and Whitehouse, 1989; Jacoby, Woloshyn, & Kelley, 1989; Lombardi, Higgins, & Bargh, 1987; Strack, Schwarz, Bless, Kubler, & Wanke, 1993). Strack et al. (1993), for example, observed that the prior exposure to relevant trait categories affected subsequent impression formation judgments (assimilation). However, when subjects were reminded of that prior exposure, they were able to escape its influence, and showed overcorrection (contrast). Similarly, in the study of Jacoby and Whitehouse (1989), a word presented just before a recognition memory test produced an illusion of memory among subjects who were unaware of that word, but a reduced recognition when subjects were aware of it.

Why then cannot people discount the effects of contaminating activations in the case of the FOK? Why, for example, cannot they escape the polluting effects of the partial clues originating from other entries at the vicinity of the target, and thus avoid the illusion of knowing associated with the CW pointers? The problem apparently derives from some of the conditions that are specific to the computation of FOK judgments. Thus, FOK and TOT judgments are prospective in nature, occurring prior to the retrieval of the target. Before knowing what the target is, it is often difficult to tell whether the clues that come to mind originate from the target itself or from other sources. In fact, it is only after a TOT state has been resolved that a person can sometimes discover the potential source of the contaminating clues that emerged during the search for the target (Koriat, 1994). In any case, the cues for the FOK often consist of partial clues and activations that are not sufficiently articulated to be traced to their source. Furthermore, according to the accessibility account, the *feeling* of knowing is based on a nonanalytic process (see Jacoby & Brooks, 1984; Jacoby & Kelley, 1987; Kelley & Jacoby, in press) that considers the mere accessibility of information without regard to its content. Only when the process becomes more analytic and deliberate is the content of the information taken into account as in the judgment that one "ought to know" the answer (see Costermans et al., 1992), and then the various clues can be deliberately pitted against each other to allow evaluation of their credibility or relevance.

A final word

The present chapter has focused on the feeling of knowing that is often experienced when one searches for a solicited information in memory. It was proposed that although the subjective experience associated with the TOT and FOK states accords with a trace-access model according to which the trace of the sought-for target is directly monitored, the FOK actually rests on an accessibility heuristic. Examination of the conditions giving rise to unwarranted FOKs is particularly informative because it suggests that indeed the FOK is based on the mere accessibility of information without

regard to its accuracy, and that the accuracy of the FOK in predicting actual memory performance depends heavily on the accuracy cf the partial clues retrieved.

The position advocated here with regard to the FOK has much in common with many discussions in both cognitive psychology and social psychology which emphasize the importance of internal cues as a basis for a variety of judgments (see, e.g. Schwarz & Clore, 1996). In the area of memory research, Jacoby and his associates have advanced the notion of a fluency heuristic as a basis for the subjective experience of familiarity (e.g. Jacoby & Kelley, 1991; Jacoby, Kelley & Dywan, 1989; Jacoby, Lindsay, & Toth, 1992; Kelley & Jacoby, 1990). They provided evidence suggesting that the experience of remembering itself relies on an inferential process, and that illusions of memory can result from the misattribution of fluency to past experience (see Jacoby & Whitehouse, 1989; Whittlesea, 1993; Whittlesea et al., 1990). The misattribution of fluency has also been seen to underlie such phenomena as illusory knowledge (Begg, Robertson, Gruppuso, Anas & Needham, 1996), illusory truth (Begg, Anas, & Farinacci, 1992; Begg, Needham & Bookbinder, 1993), illusions of difficulty (Kelley & Jacoby, in press), and a variety of perceptual illusions (Jacoby, Allan, Collins, & Lawrill, 1988; Mandler, Nakamura, & Van Zandt, 1987; Whittlesea et al., 1990; Witherspoon & Allan, 1985). Fluent processing and accessibility have also been seen to influence judgments of learning (Begg, Dull, Lalonde, Melnick, & Sanvito, 1989), subjective confidence (Kelley & Lindsay, 1993; Nelson & Narens, 1990), and judgments of comprehension (Morris, 1990).

The accessibility account of the FOK is also consistent with findings in social psychology indicating that subjective experiences and social judgments are affected by the fluency with which stimuli are processed, and by the ease with which information conies to mind. These findings too suggest that under some conditions judgments are based on a nonanalytic, inferential process rather than on direct access to the judged attribute, and that people are not always capable of monitoring the validity or relevance of the associations that come to mind (Schwarz, Bless, Strack, Klumpp, Rittenauer-Schatka, & Simons, 1991; Schwarz & Clore, 1933; Strack, Schwarz, & Gschneidinger, 1985; Strack, et al., 1993).

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3

Rapid Feeling-of-Knowing: A Strategy Selection Mechanism

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The topic of feeling-of-knowing has received increasing attention (e.g. Hart, 1965; Koriat, 1993, 1994, 1995; Metcalfe, 1994; Metcalfe, Schwartz, & Joaquim, 1993; Miner & Reder, 1994; Nelson, Gerler, & Narens, 1984; Nelson & Narens, 1990; Reder, 1987, 1988; Reder & Ritter, 1992; Schwartz, 1994; Schwartz & Metcalfe, 1992). This growth in interest has focused on the accuracy of this feeling-of-knowing judgment and the variables that influence it. There has been much less concern with the purpose or functionality of the process. Most research that looks at feeling-of-knowing uses a paradigm that asks for a judgment following a memory retrieval failure.

This approach is reminiscent of the tip-of-the-tongue phenomenon (Brown & McNeill, 1966; Smith, 1994), although there are important differences. In the tip-of-the-tongue experience, a person who cannot retrieve the answer to a question is nonetheless confident that at some later point, the answer will come to mind. The person in a the tip-of-the-tongue state wants very much to retrieve the almost-available answer. In contrast, the subject in a fecling-of-knowing experiment is merely asked to rate the likelihood of being able to recognize the answer at some later time. Although subjects' judgments are far better than chance when judging feeling-of-knowing, they are typically not in a state of "I must keep searching! I know, I know this answer." Why then are subjects able to estimate the probability of recognizing the answer? It does not exist merely to keep memory theorists employed, and surely it does not exist solely for the tip-of-the-tongue experiences. What is the function of this process?

Feeling-of-knowing as part of a rapid strategy selection mechanism

Reder (1987, 1988; Miner & Reder, 1994) recently speculated that feeling-of-knowing is part of a more general process that occurs automatically when a question is asked. The purpose of this process is to help regulate strategy selection, and this operates for all questions, not just those for which answers are currently inaccessible. This view evolved from earlier findings that implicated a *rapid* initial process that directs allocation of