Constructions of Remembering and Metacognition

Essays in Honour of Bruce Whittlesea

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Phil: *To my mum*

Jason: *To Launa and Delica, the key support beams for my own construction of things*

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Fluency and Familiarity: How Memory for Perceptual Detail Influences the Remembering of Events

Karen M. Evans and Aaron S. Benjamin

> The more I think about that seam between the familiar and the unfamiliar – and how it feels to pass from one to the other – the clearer it becomes that humans instinctively generate a sense of familiarity. You can sense it for yourself the next time you drive someplace you've never been before. Somehow, it always feels as though it takes longer to get there than it does to get back home again. It's as if there's a principle of relativity, a bending of time, in the very concept of familiarity. The road we know is always shorter than the road we don't know – even if the distances are the same (Klinkenborg, 2009).

Introduction

Recognizing events, objects, and persons from our past is a task fraught with significance. It is embarrassing to not remember someone's name, but the more socially adept among us can navigate such a situation delicately and perhaps even slyly elicit the sought-after name. Not recognizing a face as a familiar one, or misattributing that face to an incorrect prior encounter, is a failure from which we can not recover quite so inconsequentially.

There is a large and increasingly unwieldy literature on mnemonic sources of information in recognition (e.g., Wixted, 2007; Parks & Yonelinas, 2007) and on the decision processes underlying recognition judgements (e.g., Benjamin & Bawa, 2004; Benjamin et al., 2009; Stretch & Wixted, 1998). This chapter takes as a starting point the view that (at least) one mnemonic source of information can be characterized as the *familiarity* of a stimulus and that that familiarity is at least in part due to memory for prior perceptual experiences and the overlap of that memory with the current perceptual experience (e.g., Benjamin et al., 1998; Jacoby, 1983a; Whittlesea & Williams, 1998). It is this latter point that is the focus of the current chapter, in which we review evidence on the relationship between perceptual memory and recognition judgements. How does our notably poor memory for exact perceptual detail support feelings of familiarity and judgements of recognition (cf. Matzen & Benjamin, 2009; Matzen et al., in press)? If we can't remember the route, why would it seem to take longer to go somewhere than to get back home?

Memory for perceptual detail

A general and quite revealing finding in the memory literature is that items are processed more easily (i.e., with greater fluency) upon repetition (Feustel et al., 1983; Jacoby & Dallas, 1981; Scarborough et a., 1977). This rather ubiquitous effect underlies many indirect measures of memory, such as reductions in the time it takes to name a perceptually degraded word or to identify it at all, and may also contribute to judgements that are made during direct tests of memory. The facilitated processing of repeated items (i.e., repetition effects) may be rooted in different sources, including conceptual priming, but the importance of *perceptual* priming is demonstrated by the fact that changes in physical form across repetitions either dampen (Feustel et al., 1983; Roediger & Blaxton, 1987) or obliterate (Jacoby & Dallas, 1981) repetition effects, and that non-words, which cannot easily engender conceptual processing, nonetheless elicit robust facilitation effects (Feustel et al., 1983; Johnston et al., 1985; Whittlesea & Williams, 2000).

The claim that memory for perceptual detail supports recognition judgements violates the widely held assumption that our memory for perceptual details fades rapidly. Indeed, we seem to encounter numerous confirmations of this intuition (e.g., an inability to recall the exact wording of a recent email or to retrieve what the stranger in the elevator this morning looked like), and may even have the sense that there is little need to remember this information. Still, even when unable to reconstruct the details of a prior experience, we are often confronted with a strong sensation of familiarity when we encounter that same item again. In fact, the inability to readily retrieve information about a prior encounter may strengthen the role of perceptual overlap, as the surprise of fluency in such situations demands an explanation (Whittlesea & Williams, 1998; 2000). The facile processing of a repeated item can provide a 'fluency heuristic' to influence judgements of recognition memory. Research addressing the relationship between subjective senses and judgements about objective states of the world owes a great debt to the always innovative and pioneering work of Bruce Whittlesea, and we are pleased to present this brief review in the context of a volume dedicated to his career.

Perceptual fluency and recognition judgements

Before reviewing this literature, it is of use to highlight two maxims of the fluency heuristic that provide a framework for interpreting the following data, especially where null effects are observed. (1) The application of a fluency heuristic to recognition judgements is often a last resort relied upon when other sources of information (e.g., recollection) are not available. Thus, even if fluency cues from perceptual priming are available, they are only sometimes used to inform recognition judgements. (2) Use of a fluency heuristic assumes an attribution process by which facilitated perception is attributed to a task-relevant goal, such as prior exposure in a recognition task; this process is fallible, however, as fluency can be misattributed when the true source of fluency does not match the observer's goal. Note that we are not the first to point out these themes, as the following review will clarify.

Relationships between measures of fluency and recognition

Jacoby and colleagues have argued that perceptual priming and recognition memory are both classes of episodic memory, and that the degree to which performance on these two test types parallel one another is determined primarily by the specific retrieval demands of each task (Jacoby, 1983a, 1983b; Jacoby & Witherspoon, 1982). This is primarily based on early evidence that performance on perceptual tasks (usually a perceptual identification test in which degraded visual words are gradually clarified, and the time at which participants are able to identify the word is recorded) and recognition tests (old/new judgements to repeated and novel test words) alike is sensitive to manipulations that obscure or enhance access to the initial episodic trace. In particular, the magnitude of perceptual priming and hit rate associated with recognition are enhanced when study items are presented multiple times (Jacoby & Dallas, 1981), repetitions during study are spaced rather than massed (Jacoby & Dallas, 1981), higher old–new ratios are employed during test (Jacoby, 1983a), and the length of the retention interval is shorter (Jacoby, 1983a). That measures of perceptual priming and recognition often correlate has been taken as evidence that performance on both perceptual and recognition tests reflects the operation of a common episodic memory system, and that people can heuristically use the fluency of perceptual processing as evidence that an item is repeated (e.g., Jacoby & Dallas, 1981).

Importantly, however, these correlations are not always observed, and such dissociations have been leveraged in support of alternate accounts that priming and recognition operate through separate mechanisms (semantic and episodic memory, respectively) and cannot influence one another (e.g., Wagner & Gabrieli, 1998). Specifically, the amount of observed perceptual facilitation is not necessarily dependent on recognition (i.e., it is sometimes equal for repeated words that are remembered and for those that are forgotten: Jacoby & Dallas, 1981; Jacoby & Witherspoon, 1982), nor is successful recognition contingent on perceptual facilitation (Jacoby & Witherspoon, 1982). In general, dissociations between performance on these two measures are observed when encoding conditions promote deeper conceptual processing or semantic elaboration, through the use of generation tasks (Jacoby, 1983b; Jacoby & Dallas, 1981), deep encoding (Jacoby & Dallas, 1981), or increased study time (which is arguably used to enhance elaborative encoding: Jacoby & Dallas, 1981). Levels of processing manipulations have even revealed that encoding depth has opposing effects on perception and recognition, with facilitation on perceptual tasks being greater for more shallow, data-driven encoding (e.g., a word presented in isolation) and recognition rates being higher under deeper encoding conditions (e.g., words generated in an antonym task: Jacoby, 1983b). This pattern of sensitivity to episodic details such as encoding conditions requires that explanations of perceptual facilitation admit properties of episodic memory, because mere activation of decontextualized lexical representations (i.e., semantic memory) cannot account for such effects.

Although it is informative to investigate correlations between perceptual facilitation and recognition memory, later designs sought more direct evidence of the use of fluency heuristics. Rather than measuring the relationship between separate blocks of perceptual identification and recognition, Johnston et al. (1985) followed each perceptual identification trial with an immediate recognition judgement for the same word (after a separate block of study words). This sequential judgement paradigm provides participants with a readily accessible fluency cue (i.e., the ease of the preceding identification) at the time of the recognition judgement. It also provides experimenters with a measure of item fluency (identification time) for both repeated and unstudied test words. In this design, use of a fluency heuristic is inferred if items that are rapidly identified are more likely to be judged as old; of particular interest is an examination of error trials (misses and false alarms), as attributing perceptual fluency to repetition status may cause these incorrect classifications. Critically, Johnston et al. found not only that repeated words were identified more rapidly (thus observing typical perceptual fluency effects), but that words that were *judged* as old were identified faster than those judged as new (i.e., hits were faster than misses, and false alarms were faster than correct rejections). Johnston et al. additionally found that pronounceable non-words that were rapidly identified were more likely to be called old *regardless* of their actual status (i.e., hits and false alarms were identified faster than misses and correct rejections). The authors attributed the greater role of fluency cues in judging non-words to the reduced availability of elaborative encoding for study stimuli with no semantic meaning. These results provide support for the first maxim, demonstrating that fluency cues appear to be more important under conditions

in which other bases for the recognition decision, such as recollection, were reduced.

Johnston, Hawley, and Elliott (1991) further established the inverse roles of fluency cues and recollection. Across several experiments, the degree of elaborative encoding was manipulated by having subjects name study words, count vowels in study words, or view a sham study phase in which no words were actually presented but participants were told that words were being presented subliminally. During the test phase, participants completed sequential perceptual identification (naming a word as rapidly as possible as a mask slowly disappeared) and recognition judgements (as in the Johnston et al., 1985, design). When encoding conditions provided the least support for test-phase recollection (by presenting no study words to be recollected), the likelihood of calling an item old increased as the speed of identification increased, suggesting a strong reliance on fluency cues. When encoding conditions provided the strongest support for recollection (verbal production), there was no relationship between perceptual fluency and recognition, suggesting that recognition judgements were primarily informed by explicit retrieval mechanisms. That evidence for applying a fluency heuristic was absent for words studied in the production task is particularly striking given that, across the three encoding conditions, repetition effects in the identification task were actually greatest for the production group! Thus, despite the fact that repetition strongly affected identification speed, participants did not employ this heuristic to any observable degree. This contrast highlights the important fact that the cue validity of a fluency heuristic is less important in determining its contribution to recognition than is the presence of alternative sources of information (first maxim). Accordingly, the mere presence of perceptual facilitation does not ensure that this information is used to bias recognition judgements; thus, although the studies discussed earlier found correlations between perceptual identification tasks and recognition tasks, item-level analyses of sequential judgements are necessary to examine the use of fluency information during recognition judgements.

An important finding in Johnston et al.'s (1991) was revealed when they compared the use of fluency heuristics in sequential judgement conditions (as described above) to that in blocks judgements (i.e., a perceptual identification block, and then a recognition block). When recognition judgements were performed in a separate block from the perceptual identification of the same words, there was no relationship between fluency and recognition in any encoding condition. Such a finding is important in validating the use of a fluency heuristic. An alternative explanation is that the fluently processed words might be more easily recognizable due to some other stimulus characteristic (e.g., perhaps the shortest words are both easy to read and easy to recognize), but an item-selection account (Watkins & Gibson, 1988) would predict parallel effects across the mixed and blocked conditions (see also Higham & Vokey, 2000, for counterevidence to item selection).

Whittlesea and Leboe (2003) also examined recognition responses based on the fluency with which test words were processed, by performing a median-split on fluency measures (naming latencies to test words). If more fluent processing of test words biases subsequent judgements, then faster named words should be associated with higher claims of recognition than those that are named slowly. Whittlesea and Leboe found that this was true for pronounceable non-words but not for meaningful stimuli, suggesting that additional sources of evidence were available when an item was familiar. Although Whittlesea and Leboe did not assume that this other mnemonic source was recollection (but rather, a different form of fluency, as discussed at the end of this chapter), these results echo the first maxim in finding that reliance on fluency heuristic is sensitive (and generally, inversely related) to the availability of other cues.

Kelley, Jacoby, and Hollingshead (1989) discovered that perceptual fluency can also bias judgements of source recognition. After studying a mixture of visual and auditory words, participants completed a test phase in which words were presented for perceptual identification (shown at a single brief duration between visual noise masks), and then presented in full view and tested for both source and oldness simultaneously (i.e., participants classified a word as read, heard, or new). In the perception task, studied words were more likely to be identified than new words, and seen words were more likely to be identified than heard words. Seen words were also more likely to be remembered (i.e., not called 'new') than heard words. Hence, modality effects were present in both the identification and recognition tasks. The source judgements made to false alarms (which, in actuality, had no study-phase source) were particularly revealing with respect to the use of a fluency heuristic. For new words that were incorrectly judged as old, participants were more likely to call the word 'seen' if it had been identified successfully in the preceding perceptual task, and more likely to call it 'heard' if it had not been identified. The authors interpreted this effect as resulting from the application of a fluency heuristic: when words are easily processed, participants attribute this fluency to having encountered the item in the same source. In a second experiment, participants were provided with a mnemonic strategy to help them remember modality (they were told to think of positive associations for seen words and negative associations for heard words), and this greatly reduced the bias to label false alarms as 'seen.' As in the case of old/new recognition, therefore, the first maxim extends to source recognition, as source judgements are more likely to rely on fluency heuristics in the absence of alternative sources of information.

Experimental manipulations of perceptual fluency

Perhaps the most compelling evidence that perceptual fluency can be recruited heuristically during recognition is the ability to induce a sense of familiarity by experimentally manipulating the perceptual clarity of test items. In both visual and auditory modalities, subtle manipulations of perceptual noise levels at test have been shown to promote higher rates of 'old' judgements for words presented in low noise backgrounds, relative to those in high noise backgrounds (Goldinger et al., 1999; Whittlesea et al., 1990). In both of these studies, a single degraded test probe followed a short series of study words (seven words seen for 60 ms each in Whittlesea et al., 1990; eight words spoken at a normal rate in Goldinger et al., 1999), and the test probe was presented in light or heavier noise (though the difference was intended to be unnoticeable). For both repeated and unstudied words, 'old' judgements were higher in the light noise condition. Thus, even though the level of clarity was manipulated by the experimenters, independent of old–new status, participants appeared to use this fluency information in forming their recognition responses. By demonstrating that participants will attribute fluency not necessarily to the correct source (which in this case is perceptual noise levels) but to the source that the task renders most likely or salient, these results emphasize the goal sensitivity of fluency attributions stressed in the second maxim.

Several experimenters have attempted to elicit similar effects, but failed. For example, Johnston, Hawley, and Elliot (1991) followed a study list with a test phase of sequential identification and recognition tasks, in which the critical manipulation was the rate at which the visual mask disappeared during the identification task (rapid or slow). Study trials either involved naming the study word, counting vowels, or studying non-words. Across this range of encoding depths, there was no evidence that the mask removal rate biased recognition judgements. In this design, however, there was no attempt to conceal the manipulation, allowing the possibility that participants were aware of the rate changes and thus attributed the faster identification to faster mask removal. This highlights the importance of the second maxim: fluency effects are not always attributed to prior exposure, but can be attributed to other sources when they seem more likely.

In another experiment that failed to induce fluency attributions on recognition judgements, Watkins and Gibson (1988) had participants study a list of words and then complete a test phase in which identification judgements were followed by recognition judgements. The key manipulation was that during the identification task, some words were presented for longer durations than others. Neither with visual nor auditory presentation was this manipulation successful in soliciting a greater proportion of 'old' responses to long presentation items, despite strong priming effects of prior exposure on the identification task. Although the authors were careful in the visual presentation experiment to reduce the possibility that participants were aware that the duration of presentation was manipulated, they may have overlooked the first maxim of the fluency heuristic: namely, participants will only rely on fluency if they need to, and when other sources of information are available, those will likely be used instead. Therefore, it is possible that deeper processing reduced the contributions of fluency cues (as suggested by Whittlesea et al., 1990). Additionally, as noted by Higham and Vokey (2000), Watkins and Gibson's conclusion is based on null results obtained through a manipulation that may have been too weak to pose an adequate test (i.e., prime durations may not have differed enough across conditions).

Effects of preexposure to test words

One of the most revealing and well replicated manipulations of perceptual fluency is Jacoby and Whitehouse's (1989) use of subliminal 'context words' to facilitate test word processing. In this paradigm, participants view a long list of study words and then make recognition judgements to test words preceded by masked primes that match the following test word, mismatch the following test word, or are meaningless strings (e.g., xoxoxox). In Jacoby and Whitehouse's original test, participants were told either that primes sometimes matched the test words and should therefore be read in order to assist performance, or that the mask was simply a meaningless attention cue to signal the test word. For participants who were told to ignore the cues, new words were more likely to be judged as old when they were preceded by a matching prime than when preceded by a meaningless prime. Participants in this group were also less likely to judge new words preceded by a mismatching word as old, relative to the meaningless primes. For subjects who were aware that context words sometimes matched the target, the opposite pattern occurred, such that they were less likely to call new items old when they were preceded by a matching prime. Both groups experienced more fluent processing of test words that were preceded by a matching prime, but whereas participants who knew about this manipulation correctly attributed fluency to the prime word, those who were unaware of this manipulation used task goals to attribute fluency to prior exposure (demonstrating the second maxim). A similar pattern of results was found when the presentation duration of the prime was increased, suggesting that the supraliminal exposure caused subjects to be aware of the prime's presence and to discount it accordingly.

An alternative interpretation of fluency effects on recognition is provided by Huber, Clark, Curran, and Winkielman (2008). They generalized a model of perceptual identification (Huber & O'Reilly, 2003) to the recognition task of Jacoby and Whitehouse; the critical mechanism in that model is that priming first enhances fluency (by aiding perceptual mechanisms in a top-down manner) and, after longer exposure durations, decreases fluency (because of habituation). In this explanation, no attribution is necessary to explain the reversal of priming effects when the prime is presented for a longer duration. However, it is not clear that this explanation can easily accommodate the result that the effects of the prime vary with instructions to the subject, as reviewed above.

Subsequent work using this paradigm has found that the lack of awareness of primes is not necessary to the success of the manipulation (Joordens & Merikle, 19992; Gellatly et al., 1995), and in some cases awareness can strengthen the illusion (Higham & Vokey, 2000). Joordens and Merikle (1992) compared recognition following primes presented above perceptual identification threshold to those presented subliminally, and found that prime duration was sufficient to produce the Jacoby and Whitehouse (1989) illusion, independent of whether participants were told about the matching prime words, as predicted by Huber et al. (2008). Gellatly et al. (1995) found that when prime duration (for a stream of rapidly presented prime words) was held constant, the illusion could be selectively produced under instructions directing participants to encode the words, versus instructions directing them to monitor the stream for a word matching the subsequent recognition probe. Gellatly et al. concluded that the matching instructions did not produce the illusion because they rendered the match between prime and test probes salient, thus making the prime a stronger candidate for explaining the fluency (similarly, salience was manipulated by prime duration in Joordens and Merikle's study and by awareness in Jacoby and Whitehouse's study). Higham and Vokey (2000) proposed that the illusion itself is due to an identification heuristic in which participants attribute their ability to read a rapidly presented prime to prior exposure; awareness of the prime's relationship to the target thus motivates use of this heuristic. Long durations fail to produce this illusion because the prime identification is too easy to be influenced by prior exposure, thus making the identification heuristic less viable.

A recent series of experiments by Westerman and colleagues has extended Jacoby and Whitehouse's (1989) paradigm to a variety of form manipulations, in order to assess the role of expectancy in fluency heuristics. These studies have revealed that enhanced false alarm rates to fluently processed (primed) words can be prevented not only by providing a more likely explanation for the fluency effects (as in Jacoby & Whitehouse, 1989), but also by making perceptual fluency an unlikely explanation (i.e., reducing cue validity without presenting a better alternative). For example, Westerman, Lloyd, and Miller (2002) reduced the validity of fluency cues by having participants complete an auditory study list followed by a visual test list containing context words. In this paradigm, prior auditory processing would not be expected to facilitate visual processing at test, and so the sense of fluency produced by the matching primes should not be attributed to prior exposure. Supporting this hypothesis, matching primes did not enhance false alarm rates in the presence of a modality change. Westerman et al. also found that words studied aurally were more likely to be judged as 'old' when the study list also contained visual words (that match the test modality). Thus, participants' willingness to attribute enhanced fluency to prior exposure was sensitive to their expectations that the test words should be processed more fluently; when modality always changed between study and test, participants had no reason to expect more fluent processing, and thus did not attribute fluency to repetition. (A very similar pattern of results also obtained for more subtle, within-modality changes of words to pictures, and changes in font style: Westerman et al., 2003.) Additionally, Westerman et al. found that when given a sham 'subliminal' study list (as in Johnston et al., 1991), participants who viewed visual noise (that allegedly contained subliminal study words) exhibited greater fluency attributions to visually presented (and primed) test words than participants who heard auditory study noise. As in Johnston et al.'s study, these effects, in the absence of any memory signal to counter them, were greater than when there was a true study list.

Experimental manipulations of recognition

Demonstrations of the fallibility of fluency heuristics have not only examined the extent to which enhanced perceptual ease due to stimulus characteristics can be falsely attributed to prior exposure, but also the extent to which fluency resulting from prior exposure can be falsely attributed to perceptual characteristics. Witherspoon and Allan (1985) had participants view a list of words, and then (in a superficially unrelated task) evaluate the duration for which briefly presented words remained onscreen. Words that had been seen before were evaluated as remaining onscreen longer than new words, and this effect obtained whether participants were asked to name the words or not. Jacoby, Allan, Collins, and Larwill (1988) had participants listen to a series of sentences, and then rate the noise levels of a set of purportedly unrelated sentences. Participants rated repeated sentences as occurring in less auditory noise than new sentences, even though the noise levels were matched across stimulus classes. Similar effects have been found for single words presented aurally (Goldinger et al., 1999) and visually (Whittlesea et al., 1990). These studies underscore the importance of the second maxim: the use of a fluency heuristic in recognition memory and the presence of repetition-based perceptual fluency effects are not the same thing. Perceptual fluency can arise from a variety of sources, and can be attributed to a variety of sources, sometimes leading to an imperfect mapping (reviewed in Benjamin & Bjork, 1996; Jacoby et al., 1989).

The fluency criterion

Until this point, we have presented evidence that certain stimuli are perceived as 'more fluent' without providing the necessary qualifier: fluent relative to what? Jacoby proposed that fluency is evaluated relative to the difficulty of the current task (Jacoby & Dallas, 1981). By this rationale, performing certain operations (e.g., reading words) is associated with a

general level of difficulty, and when an individual item is further processed more fluently than expected (Benjamin et al., 1998; Whittlesea & Williams, 1998), this deviation is attributed to repetition (or alternative sources that the experimental context renders plausible: Goldinger et al., 1999; Whittlesea et al., 1990). In contrast, Whittlesea and Leboe (2003) suggested that fluency can be judged in two ways. First, item fluency can be assessed relative to other items from the same stimulus class. This is similar to Jacoby's relative fluency, though Whittlesea and Leboe emphasize the comparison to items in the stimulus class (rather than items in the current task); because this class-wide fluency is a contextually invariant property, Whittlesea and Leboe label it 'absolute fluency'. The second type of fluency judgement they propose is assessed relative to the expected fluency for that particular item. This item-level expectation of fluency requires a history of experience processing that item and therefore is only applicable to familiar stimuli (i.e., non-words do not give rise to this type of fluency). Finally, Westerman (2008) proposed that fluency is compared not to the fluency of the task, the stimulus class, or the particular item, but to the fluency of all other items in the current context (i.e., other test probes). This is supported by evidence that illusions of familiarity (obtained through Jacoby and Whitehouse's, 1989, manipulation of perceptual priming and through Whittlesea's, 1993, manipulation of conceptual priming) weaken as the proportion of test items that are primed increases (Westerman, 2008), and that this effect holds for within- but not between-subject manipulations. It is unclear whether one, none, or all of these theories are correct, but the recent revival of interest in identifying the basis of fluency judgements holds promise for continued progression.

Summary

Human memory systems are highly fallible, and a premium is placed on the ability to adaptively respond to the particular demands of infinitely varying situations in which remembering is required and yet details are sparse (Benjamin, 2008). One important tool used to confront imperfect memory is the monitoring and interpretation of ongoing perceptual events. When we see ourselves engaging in more rapid perception than we expect, we ask: does this enhanced perception owe perhaps to a recent prior encounter with this stimulus? This chapter reviewed evidence that this process takes place and that the answer is often in the affirmative, particularly when the situation lends that attribution plausibility and no superior basis for a memory judgement is available. It is true that memory affects perception, as noted so poetically at the outset of this chapter. But it is no less true that perception affects memory, and that sometimes the road seems short because it is short, not because we have travelled it previously.

role of attribution and construction emerges despite the range of cognitive tasks that form the basis of the studies described across the chapters of this volume and despite the conventional classification of these studies as investigations of remembering on one hand and metacognition on the other.

Rather than revealing divisions between functionally distinct subsystems of minds, such psychological dichotomies and even finer distinctions are imposed on mind by the investigator, in an attempt to break the apparent complexity of mind into manageable chunks. But according to Whittlesea, that breaking is an act of violence that fractures the very organization that the investigator is seeking to comprehend. Simply because the scientist is human, any attempt at understanding is a creative, constructive activity that imposes an organization on the thing to be understood that is different from what the thing really is. And that is the paradox within which cognitive scientists must conduct their business; it is the necessary starting point for any useful theoretical advance. We encourage our readers to avoid the reification error; of assuming that what seems obvious must be true. As a topic of investigation, the human mind is like the Delphic oracle, giving ambiguous messages that the credulous take as unequivocal support for their biases.

Across the chapters of this volume, there is a diversity of topics discussed and the authors provide a number of important, distinctive insights into the nature of human cognition. Hopefully, the unique aspects of each chapter will be useful and provocative, but our greater hope is that readers will use their powers of construction to adopt a more holistic appreciation of this volume. If you find yourself at this final stage of the book swimming in distinctions and nuance, why not abandon your *sharpener* ways, at least temporarily, and adopt a *leveller's* perspective. If it is not an approach you are used to, it might be a fun change and it will give you a taste of what it's like to be schooled in the Whittlesea style. To paraphrase John Lennon, perhaps one day you will even join us.

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