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The attentional blink is attenuated for objects of expertise

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ABSTRACT
Perceptual expertise with a specific domain of stimuli has been shown to afford numerous benefits to information processing performance. Previous work has suggested that face perception, a domain of perceptual expertise for many, is less susceptible to one of the most robust examples of information processing limits, namely the attentional blink. Here we extend this finding to non-face objects of expertise, supporting an expertise-related account of this benefit. Further, the attenuation of the attentional blink phenomenon was correlated with expertise at an individual level, whereby greater expertise with cars yielded a smaller attentional blink for these stimuli. These results support previous work suggesting that extensive experience with a class of objects, such as in the case of perceptual experts, can reduce the consequence of inherent limitations in human information processing. Possible mechanistic accounts of how experience may circumvent processing limitations are discussed.

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Extensive experience and the development of visual expertise with a particular domain of stimuli affords numerous performance benefits, allowing experts to process highly complex objects within their domain of expertise with apparent ease. However, visual information processing is inherently limited with processing bottlenecks evident in core aspects of perception (e.g., Bouma, 1970), attention (e.g., Chun & Potter, 1995) and working memory (e.g., Luck & Vogel, 1997). Thus, at any instant, the visual environment we experience typically has more information than we can possibly process. Recent evidence suggests that perceptual expertise with a domain of stimuli may aid experts in circumventing or minimizing the consequences of these inherent bottlenecks on their performance (e.g., Curby & Gauthier, 2007; Curby, Glazek, & Gauthier, 2009; Evans, Georgian-Smith, Tambouret, Birdwell, & Wolfe, 2013; Scolari, Vogel, & Awh, 2008; Thompson & Tangen, 2014). Here we further examine the potential of perceptual expertise to attenuate the impact of inherent processing limitations.

Expert visual object recognition is characterized by the adoption of what has been referred to as a holistic processing strategy. Experts, unlike novices, appear to be obliged to process objects of expertise as an undifferentiated whole, with object features processed in the context of their relations to other features (Tanaka, 2001; Tanaka & Sengco, 1997). In contrast, novice processing is characterized by a strategy where features are instead processed more independently. It has been suggested that face processing, which is characterized by a similarly holistic style, may serve as a useful model of perceptual expertise more generally (Diamond & Carey, 1986; Tanaka, 2001). Support for the potential usefulness of face processing as a model of expert object processing can also be found at a neurophysiological level. Expert object recognition is associated with increased recruitment of a region of the fusiform cortex in the temporal lobe that is typically associated with face processing (Gauthier, Skudlarski, Gore, & Anderson, 2000; Gauthier, Tarr, Anderson, Skudlarski, & Gore, 1999). Furthermore, the perception of face and non-face objects of expertise are both associated with an increase in the amplitude of the N170 event-related potential (e.g., Bentin, Allison, Puce, Perez, & McCarthy, 1996; Gauthier & Curby, 2005; Tanaka & Curran, 2001). The degree to which fusiform cortex is recruited and the amplitude of the N170 is increased in response
to viewing (and processing) objects of expertise is related to the individual’s level of expertise at recognizing these objects (Gauthier, Curran, Curby, & Collins, 2003). Furthermore, these neurophysiological correlates of expert performance are related to indices of the degree to which such objects are processed holistically (Gauthier et al., 2003).

The qualitatively different holistic representations created by experts afford numerous processing advantages. Representation of objects of expertise are more robust to noise (Thompson & Tangen, 2014), support faster identification judgments (Tanaka, 2001; Tanaka & Taylor, 1991), show an earlier onset of recognition performance (Curby & Gauthier, 2009), can be searched more efficiently (Tong & Nakayama, 1999), and even provide an advantage in visual short-term memory (VSTM) performance (Curby et al., 2009; Curby & Gauthier, 2007).

VSTM is a particularly well-established example of a bottleneck in visual information processing, with the capacity of VSTM estimated to be approximately 3–4 objects (Luck & Vogel, 1997). While an object-based limit has been proposed, it is also the case that information load per to-be-remembered object can influence capacity estimates (Alvarez & Cavanagh, 2004). According to evidence from Alvarez and Cavanagh (2004), VSTM capacity for inherently complex objects, such as faces, should be lower than that for simple objects, such as colour patches, because they contain a higher information load. However, Curby and Gauthier (2007) found a VSTM advantage for faces compared to other, similarly complex, non-face objects. This VSTM advantage is attributed to individuals’ expertise with faces. A second study using non-face objects of expertise, cars, as the to-be-remembered items found a similar VSTM advantage thereby bolstering the perceptual expertise account of this advantage (Curby et al., 2009). Thus, perceptual expertise may allow individuals to decrease the information-load of each to-be-remembered item by creating more effective (holistic) representations, thereby allowing better utilization of the limited VSTM system (Curby et al., 2009). Regardless, the VSTM advantage for objects of expertise provides evidence of the potential of perceptual expertise to minimize the consequences of more inherent processing bottlenecks that typically constrain human information processing.

Another robustly demonstrated marker of a bottleneck in information processing is referred to as the attentional blink (AB; Broadbent & Broadbent, 1987; Chun & Potter, 1995; Raymond, Shapiro, & Arnell, 1992). The AB refers to a limitation in our ability to process sequentially presented target stimuli. When two targets are presented in rapid serial visual presentation (RSVP), there is a period of several hundred milliseconds after the presentation of the first target (T1) when accurate identification of the second target (T2) is impaired. The AB has been demonstrated with a wide range of stimuli (for a review, see Shapiro, Raymond, & Arnell, 1997). Several models of the AB have been proposed. For example, the two-stage model of the AB has proposed that all items in the stream are rapidly detected but then must be consolidated into VSTM via a capacity-limited stage in order to achieve a durable, reportable state (Chun & Potter, 1995). The slow process of such consolidation leads to a bottleneck, which impairs the ability to detect or identify T2. More recently, it has been proposed that the AB results from a temporary loss of control over the prevailing attentional set (Di Lollo, Kawahara, Shahab Ghorashi, & Enns, 2005) or an over-exertion of control during memory consolidation (Taatgen, Juvina, Schipper, Borst, & Martens, 2009). Additional models have also been proposed that posit that a competitive gating process occurs that prohibits entry into working memory (Olivers & Meeter, 2008; Wyble, Bowman, & Nieuwenstein, 2009). While the basis of the AB is still a topic of a lively empirical debate, it is widely considered as a classic example of the limitations that constrain visual information processing.

Recent work has demonstrated that the AB may be a less rigid bottleneck than originally thought. For example, as little as one hour of directed training on an RSVP paradigm can eliminate the AB effect (Choi, Chang, Shibata, Sasaki, & Watanabe, 2012). Several studies following-up on Choi and colleagues’ work attributed this attenuation of the AB to changes in temporal expectancies (Shin, Chang, & Cho, 2015; Tang, Badcock, & Visser, 2014; Willems, Damsma, Wierda, Taatgen, & Martens, 2015). In addition, other studies have documented the considerable variability in susceptibility to the AB across individuals and have suggested that individual differences in executive function and breadth of attentional focus are critical factors in the AB (for a review, see Willems &
These findings raise the interesting question as to whether other types of training that result in differences between individuals, such as real-world experience and skill level with a stimulus domain, might also impact one’s susceptibility to the AB. Potentially relevant to the question as to whether real-world experience and/or skill level can impact susceptibility to the AB is evidence that faces—a category considered to be a domain of expertise for most individuals—also experience an advantage in terms of the susceptibility to the AB (Awh et al., 2004; Landau & Bentin, 2008). For example, Landau and Bentin (2008) reported that faces were immune to the AB effect using the classic RSVP paradigm traditionally used to demonstrate the AB. Awh et al. (2004) also demonstrated an attenuation of the AB for faces using a different paradigm where two targets are also identified in rapid succession, but not in the context of a RSVP stream. Awh et al. (2004) proposed a multi-channel model to account for this effect, arguing that faces access a distinct (configural) processing channel, whereas other objects are processed in a feature-based channel, thus reducing the competition for the same resources and thus the AB. This multi-channel model account would predict that the AB for non-face objects of expertise should also be attenuated. That is, perceptual expertise should attenuate typical processing limitations by allowing experts to recruit additional, non-overlapping resources for objects of expertise. Further, given that the level of configural (holistic) processing varies with an individual’s level of expertise, the degree to which the AB is attenuated should be predicted by an individual’s level of expertise. Here we test these predictions by comparing the AB for faces as T2 to replicate previous work (Awh et al., 2004; Landau & Bentin, 2008) and the AB for cars as T2 in individuals with a range of car expertise.

Method

Participants

Fifty-five individuals (50 male1) with a range of experience in identifying cars and normal or corrected-to-normal vision participated (age, M = 21.5, SD = 2.5). Perceptual expertise with cars was quantified using a previously established measure (Gauthier, Curby, Skudlarski, & Epstein, 2005), in which participants made same/different judgments about car images at the model level, regardless of year. To provide a baseline of perceptual skills, participants also made same/different judgments about birds at the level of species (Figure 1(A)). A car expertise index was defined as car d′ – bird d′. Subtracting bird d′ provided a means for controlling for general differences in visual skill/recognition ability that are unrelated to participants’ perceptual expertise with cars. The mean car d′ was 1.83 (SD = 1.06) with a range from −0.11 to 4.08 and the mean bird d′ was 0.71 (SD = 0.35) with a range from −0.18 to 1.46. The mean car expertise index for the sample was 1.12 (SD = 0.96) with a range from −0.33 to 3.20.

AB stimuli

Stimuli were greyscale images of 56 different Caucasian faces (28 men and 28 women, close-up portraits without hairlines), 56 different car images (28 two-door cars and 28 four-door cars, displayed at a 45 degree angle), 112 different watch images (56 with non-numbers and 56 with numbers), and 112 different images of furniture items (e.g., chairs, sofas, tables). All images were the same size. They were presented at the centre of a 19” monitor and subtended a visual angle of approximately 6° × 5°.

AB procedure

A trial started with 500 ms of fixation, immediately followed by a sequence of 20 images presented each for 68 ms with no time interval between items. Two targets (T1 and T2) were predefined and interspersed among 18 furniture images that served as distractors (Figure 1(B)). Following each trial the participant was prompted to respond to both T1- and T2-associated tasks. T1 was a watch and was presented in every trial. T1 was presented equally in either the 4th or 7th serial position in the stimulus series. In 50% of trials a watch with numbers was presented, the other 50% of trials contained a watch with non-numbers (i.e.,

1We recruited individuals for the study in two ways: (1) by advertising a need for “individuals with a range of experience identifying cars”, which yields mostly male participants; and (2) through an online recruitment pool, where we limited it to male participants to better match participants recruited via the different avenues. Expert and novice participants were recruited via both avenues.
dots, lines). The participants’ T1 task was to identify if the watch contained numbers or non-numbers.

T2 was a face in 50% of trials and a car in 50% of trials. T2 randomly appeared at lags 3, 5, 9, or 11 following T1 (with stimulus onset asynchronies of 204 ms, 340 ms, 612 ms, and 748 ms, respectively). For the face targets, 50% were male and 50% were female faces. For the car targets, 50% were two-door cars and 50% were four-door cars. Participants were asked to make a gender discrimination for T2 faces and a type discrimination for T2 cars. Both T1 and T2 responses were withheld and given at the end of each trial. Accuracy was stressed over speed for the responses. Participants performed eight blocks of 28 trials, with four alternating blocks of each T2 type and with order counterbalanced across participants.

Face stimuli were chosen as the comparison category for T2 identification to enable us to compare our results to, and potentially replicate, previous work showing an attenuated AB for faces (Awh et al., 2004; Landau & Bentin, 2008). In addition, our primary comparison of interest was in the difference between experts and novices in the magnitude of the AB. Thus, the face category provided a comparison condition in which the stimuli were objects of expertise for both car novices and experts.

Results

Participants with T1 accuracy >2SD below the group mean were excluded (n = 2). Using previously established criteria for car expertise (Gauthier et al., 2003), we performed a group-based analysis consisting of 26 car experts (i.e., expertise index > 1.0 and car d’ > 2.0) and 24 car novices (i.e., expertise index < 1.0). This group analysis excluded three participants who had an expertise index greater than 1.0, but a car d’ less than 2.0 and thus did not meet the inclusion criteria for either group. Figure 2 illustrates the mean T2
accuracy data for each lag and T2 category by group. Data were then collapsed across lag 3 and 5 (inside the blink; cars: \( t(49) = 0.607, p = .547 \); faces: \( t(49) = 0.081, p = .936 \)) and lags 9 and 11 (outside the blink; cars: \( t(49) = 1.009, p = .318 \); faces: \( t(49) = 1.080, p = .286 \)) because there were no significant differences between the lags in these pairings.

A 2 (lag: inside blink, outside blink) × 2 (T2 category: face, car) × 2 (group: expert, novice) repeated measures ANOVA revealed significant main effects of lag (\( F[1,48] = 126.608, p < .001, \eta^2 = 0.725 \)) and T2 category (\( F[1,48] = 81.552, p < .001, \eta^2 = 0.629 \)) with performance being higher outside the blink and for faces as compared to cars. The T2 category x group interaction was significant (\( F[1,48] = 27.244, p < .001, \eta^2 = 0.362 \)) with a larger effect of expertise for cars than faces. The lag x group interaction was also significant (\( F[1,48] = 4.653, p < .05, \eta^2 = 0.088 \)) with a larger increase in accuracy from inside to outside the blink for novices compared to experts. The T2 category x lag interaction was significant (\( F[1,48] = 20.857, p < .001, \eta^2 = 0.303 \)) indicating that there was a larger increase in accuracy from inside to outside the blink for cars compared to that for faces. Finally, the three-way group x T2 category x lag interaction was significant (\( F[1,48] = 9.985, p < .005, \eta^2 = 0.172 \)).

To explore this three-way interaction, we performed 2 (lag: inside blink, outside blink) × 2 (group: expert, novice) repeated measures ANOVAs for the car and face data separately (Figure 3). For cars as T2, there were significant main effects of lag (\( F[1,48] = 90.391, p < .001, \eta^2 = 0.653 \)) and group (\( F[1,48] = 32.153, p < .001, \eta^2 = 0.401 \)) with accuracy being higher outside of the blink and for car experts, respectively. The lag x group interaction also reached significance (\( F[1,48] = 12.528, p < .005, \eta^2 = 0.207 \)). As shown in Figure 3, car experts displayed a smaller blink compared to car novices when cars were presented as T2, which is consistent with the continuous analysis presented in Figure 2. For faces as T2, there was a significant main effect of lag (\( F[1,48] = 9.799, p < .005, \eta^2 = 0.170 \)) with accuracy being higher outside of the blink. The main effect of group was not significant (\( F[1,48] = 0.097, p = .757, \eta^2 = 0.002 \)). The lag x group interaction also did not reach significance (\( F[1,48] = 2.055, p = .158, \eta^2 = 0.041 \)).

As shown in Figure 3, across all participants (excluding the 2 T1 accuracy outliers) the magnitude of the AB was significantly larger when cars were presented as T2 compared to when faces were presented as T2 (\( t(52) = 4.507, p < .001 \)), which replicates previous findings of an attenuated blink for faces compared to other objects (Awh et al., 2004; Landau & Bentin, 2008).

To test the continuous nature of this effect, we tested a correlation analysis examining the degree to which car expertise predicted AB magnitude (i.e., [accuracy outside the blink] – [accuracy inside the blink]). Car expertise index was significantly correlated with the magnitude of the AB for cars (\( R = 0.400, p < .005 \); Figure 4(A)), but not faces (\( R = 0.168, p = .230 \); Figure 4(B)). The lack of a correlation between car expertise and blink magnitude for faces as T2 suggests that individuals with more expertise with cars were not simply more motivated or better at the AB task in general. Given that there was not a significant AB effect for faces as T2, it may not be surprising that this correlation was not significant. However, there was still substantial variability across participants in the magnitude of the AB for faces as T2 (range: 5–15%). Therefore, the lack of a correlation between AB size for faces and car expertise, is consistent with a dissociation and suggests that car expertise specifically, and not more general visual or cognitive differences between the groups, was associated with a reduced AB for cars as T2.

**Discussion**

These results demonstrate that expertise with non-face objects supports a domain-specific attenuation of the AB. Further, the degree to which the AB was attenuated for objects of expertise, in this case cars, was related to an individual’s level of expertise with this category. The greater an individual’s level of expertise identifying cars, the less susceptible they were to an AB for cars. Participants, regardless of expertise with cars, demonstrated a reduced susceptibility to the AB for face, compared to car, stimuli. This attenuation of the AB for face stimuli replicates previous findings (Awh et al., 2004; Landau & Bentin, 2008).

Our results indicate that perceptual expertise with a domain of stimuli facilitates the attenuation of one of the most established and robust examples of an information processing bottleneck, the AB. While previous work has shown that perceptual expertise supports enhanced recognition (Curby & Gauthier, 2009; Tanaka, 2001; Tanaka & Taylor, 1991; Thompson &
Tangen, 2014), search efficiency (Tong & Nakayama, 1999), and VSTM performance (Curby et al., 2009; Curby & Gauthier, 2007), here we provide evidence that perceptual expertise may also allow individuals to circumvent bottlenecks associated with visual awareness and conscious perception. While the two-stage model (Chun & Potter, 1995) suggests a role of VSTM in the AB effect, we cannot conclude here that the VSTM advantage for objects of expertise (Curby et al., 2009; Curby & Gauthier, 2007) and the AB attenuation found here are driven by the same mechanism. Instead, we consider these two examples of the robust ability of perceptual expertise to afford information processing advantages.

Our results are generally consistent with an account of increased processing efficiency for objects of expertise. There are a number of potential mechanisms through which an individual’s real-world expertise with a domain of stimuli might increase the efficiency with which they process these stimuli. For example, our results are consistent with the multi-channel model of the AB proposed by Awh et al. (2004), whereby processing efficiency is increased in experts via the utilization of an additional, non-overlapping resource (processing channel). Specifically, the transition from adopting a feature-based to a more holistic processing strategy that occurs with the development of perceptual expertise (Gauthier et al., 1999), may allow experts to recruit additional, non-overlapping resources, thereby attenuating the AB. Thus, this account suggests that expertise allows individuals to circumvent the bottleneck apparent in the AB paradigm by reducing demands on a common capacity. If expertise allows for recruitment of an additional resource, then it is possible that car experts would show an attenuated AB for non-expertise objects that are presented as T2, when T1 is a car. Future work could investigate this possibility that expertise allows individuals to access another resource “channel” by manipulating T1/T2 in this way.

Another, equally interesting, account of the attenuation of the AB for objects of expertise may be related to the salience and/or motivational value these stimuli have for expert observers. Landau and Bentin (2008) suggest that faces’ immunity to the AB may at least partially reflect the perceptual salience of the stimulus category, which could reduce the amount of resources needed to detect faces (or other non-face objects of

**Figure 3.** AB accuracy shown separately for cars as T2 (left) and faces as T2 (right). Error bars represent standard error of the mean. *p < .005.

![Figure 3](image1)

**Figure 4.** Scatterplots illustrating (A) a significant correlation between car expertise and the magnitude of the AB when car stimuli were presented as T2 and (B) a non-significant correlation between car expertise and the magnitude of the AB when face stimuli were presented as T2.

![Figure 4](image2)
expertise) among distractors from a different category. The authors suggest that faces may be more salient than other objects in the AB paradigm due to a high-level "pop-out" effect, which results from different effects of masking from the distractors in the RSVP for faces compared to other objects. However, we demonstrate that the same stimulus is more or less susceptible to the AB depending on an observers' degree of expertise with the object category. Here differences in perceptual salience due to masking effects cannot explain the attenuation of the AB because, given the same stimuli and presentation, the attenuation of the AB differed only by degree of expertise.

Other related accounts might suggest that perceptual expertise with cars resulted in a decrease in the perceived featural similarity between the car targets and the distractors in the RSVP as the AB effect is larger when distractors and targets share features (Visser, Bischof, & Di Lollo, 2004). This decrease in featural similarity could potentially cause a salience-like effect thereby accounting for the attenuated AB observed among car experts. However, given the distractors (furniture) and car targets used in the current task were perceptually quite distinct, featural similarity was unlikely a driving factor in determining the AB. However, further studies could empirically test this possibility by directly manipulating the perceptual similarity of the distractors, relative to the car targets.

While perceptual-level salience accounts of the expertise-related reduction in the susceptibility of cars to the AB, among car experts, appear unlikely, it is possible that motivational salience impacts the susceptibility of objects of expertise to the AB. That is, the motivational salience of objects of expertise might lead to a prioritization of their processing, not unlike the way inherently motivational stimuli, such as emotional faces, are thought to be prioritized. Such attentional prioritization has been shown to reduce the AB observed for those stimuli (e.g., Anderson & Phelps, 2001; Maratos, Mogg, & Bradley, 2008) and to spontaneously induce a "blink" that impacts the processing of subsequent stimuli in an RSVP stream (Most, Chun, Widders, & Zald, 2005). Future work could address whether objects of expertise are similarly prioritized by investigating whether they are preferentially processed even when they are task irrelevant, and whether this manipulation results in a spontaneously induced “blink” that impacts the processing of subsequent stimuli in an RSVP stream.

Another potential mechanistic account for the attenuated AB for objects of expertise can be found in the broader AB literature. Specifically, objects of expertise may be less susceptible to the AB due to their extreme familiarity. Consistent with this possibility, when presented as the second target in the classic AB paradigm, unfamiliar faces, as compared to famous faces, were more susceptible to the AB effect (Jackson & Raymond, 2006). Notably, here we refer to familiarity as being irrespective of skill level and instead defined by an observer's level of experience or exposure to the stimuli. In contrast, while expertise almost always coincides with extreme familiarity, it is defined by an individuals' skill or performance level at identifying exemplars within the expert domain. A familiarity account would suggest that the reduced susceptibility to the AB among experts is not a direct result of their skill level, but rather their more general, greater exposure to the stimuli. This would suggest that even those who are unable to attain expert level performance might also experience processing benefits by virtue of their extensive experience with an object category. Despite the finding that the level of attenuation of the AB for cars is predicted by an individual's level of skill identifying cars, it is still possible that familiarity might be, at least in part, driving this relationship. A familiarity account could be tested using composite images from a domain of expertise (i.e., to create unfamiliar objects of expertise) or by training a group of individuals to have comparable familiarity but different degrees of expertise.

Previous work has demonstrated that directed training with an RSVP paradigm (Choi et al., 2012; Shin et al., 2015; Tang et al., 2014; Willems et al., 2015) can attenuate or even eliminate the AB effect. Here we extend these findings by demonstrating a domain-specific attenuation of the AB after real-world training with an object category. These two examples of training effects, one at a task-level and the other at a stimulus/domain level, likely arise via distinct mechanisms. Thus, these findings highlight the complexity of the processing limitation(s) revealed by the AB paradigm, as well as the potential of training, at both the task and stimulus level, to attenuate this limitation.

Findings of a reduced AB with the addition of a concurrent secondary task (Arend, Johnston, & Shapiro, 2006; Olivers & Nieuwenhuis, 2005, 2006) also raise interesting questions about the potential basis of the
reduced susceptibility of objects of expertise to the AB. The ability of a secondary task to attenuate the AB has been attributed to the “spreading of attention” that combats the potential overinvestment of attention to the RSVP stream (Olivers & Nieuwenhuis, 2006). However, it is unclear how perceptual expertise at identifying T2 might reduce the likelihood of over-investing in the processing of the RSVP stream. One possibility is that experts might invest less attentional resources in the RSVP stream as a consequence of the task being easier for them. This would suggest that the mechanisms underlying the effect of expertise are two-fold, including both those driving the greater ease with which objects of expertise can be processed in the RSVP stream as well as the indirect benefit of this greater ease in terms of reducing overinvestment in the processing of the RSVP stream. Thus, future studies should consider the possibility that there may be multiple, concurrent avenues via which the AB for objects of expertise is attenuated.

The current study demonstrates for the first time that there is an attenuated AB for non-face objects of expertise and that the degree of attenuation is related to one’s level of expertise. While the current study cannot differentiate between the potential mechanistic accounts of this attenuation, the possibilities outlined above provide a roadmap for future work to investigate how perceptual expertise circumvents robust bottlenecks in visual information processing.

In sum, we provide further evidence that the processing of objects of expertise can circumvent robust constraints within human information processing. Further studies are required to not only understand if and how perceptual expertise might increase processing efficiency, but also to tease apart the contribution of expertise from more general consequences of extensive experience with a domain of stimuli. Regardless, these findings highlight the exciting potential of perceptual expertise to reduce the inherent limitations that constrain everyday information processing.

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References


