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Book review essay

Embodied cognition: Grounded until further notice

Grounding cognition: The role of perception and action in memory, language, and thinking
By Diane Pecher and Rolf A. Zwaan
Cambridge: Cambridge University Press, 2005. £45, ISBN-13: 978-0-5218-3464-3

Embodiment *just is* the problem, not the solution

The organizing principles of Embodied Cognition (EC) have been paraphrased in many ways: for example, mental phenomena cannot be explained in terms of internal information-processing states independent of the details of bodily implementation; explaining cognition requires explaining bodily function and sensorimotor activity; thinking is deeply constrained by physical processes or properties instantiating it; cognition cannot be fruitfully understood without knowing how the body 'shapes' it, etc.

All such paraphrases imply that the proper context for evaluating the framework is nothing less than the old mind/body problem. Yet, within this context, EC faces at least three immediate challenges. One is the challenge of actually getting an *explanation* off the ground. The old mind/body problem begins by *granting* or *assuming* that minds are somehow related to bodies, and then poses the question of how to *precisely articulate the nature of that relation*. If EC is to be worth taking seriously, it must be possible to state its principles in a way such that they do not turn out to be a mere *re*statement of the very assumptions that made the old mind/body problem a problem in the first place. Thus, it is crucial to distinguish 'embodiment' as it refers to the *explanandum* (i.e. the problem under investigation) versus an *explanans* (i.e. as the name of a putative solution). Of course, EC is rarely touted as issuing any such substantive metaphysical explanation that would shed light on the presence of that mind/body relation. But that is no reason for supposing that it need not give one, and there are good reasons for supposing that it must. A second challenge, then, is to formulate a *positive* explanation. As an attempt to stand Classical Cartesian Cognitivism (CCC) on its head, the organizing principle—however paraphrased—are not insignificant. Yet, if EC is to count as more than a narrow, negative critique, its proponents cannot merely state what the mind/body relation is *not*, or how one might fail to explain it. A third, related challenge is that of articulating a positive explanation that is *informative*. Overcoming the first two challenges is unhelpful unless the positive reformulations of EC's organizing principle can be shown not to lapse into trivializations when put in sufficiently general positive terms, for example, that minds depend on or are supported by bodily interaction with the world.

Attempts to meet these three challenges have yielded underwhelming analyses. Many EC researchers have utilized the language of 'arising', 'bringing forth', 'emergence', as in the claim of Thelen *et al.*, (2001, p. 1) that 'to say that cognition is embodied means that it arises from bodily interactions with the world'. Yet, underlying concepts like ARISE or EMERGENCE are rarely unpacked,

overused, and often muddled. For example, Lakoff (1987, p. 12) asserted that the relation between mental phenomena and embodiment is one of *consequence*: '[cognition is] a consequence of the nature of human biological capacities and of the experience of functioning in a physical and social environment'. But what might it mean to say that the relation is one of 'consequence'? Is the claim that lower-level bodily phenomena *cause* higher-level cognitive states?[1] Similarly, Varela, Thompson, and Rosch (1991, pp. 172–73) defined the view with the following two conditions: 'first, cognition depends upon the kinds of experience that comes from having a body with various sensorimotor capacities, and second, that these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological, and cultural context'. Varela *et al.'s* first condition involves a relation of dependency, while the second takes the relata to occur in contexts; but dependence-in-context hardly makes for an informative explanation. What do such dependence relations consist in? How are they different from, say, supervenience, determination, correspondence, counterfactual dependence, mereological constitution, or realization? Generally, EC researchers lack answers here.

Embodied cognition: A framework in search of itself?

Some EC researchers have focused their attention on transduction (i.e. mapping the constituents of perceptual experience on to arbitrary symbols representing conceptual structure); many more have instead focused on symbol grounding (i.e. mapping those symbols back on to the world), and thus the corollary project of analysing the concept Embodiment in terms of a more basic relation designated by GROUNDING. As such, GROUNDING is currently enjoying wide influence in many of areas of Empirical Psychology and Cognitive Science; some have even suggested that analysis of grounding is *the* central project of EC (e.g. Anderson, 2003, p. 92). Yet, others have suggested the converse: e.g. 'Through embodiment, symbols get physically grounded, and such meaning is defined through interaction with the world' (Riegler, 2002, p. 341). Such claims illustrate the unstable, disunified theoretical foundations of EC (e.g. it is absurd to treat EMBODIMENT and GROUNDING as simultaneously designating relations that are each conceptually prior to the other).

EC's more judicious proponents seem rightly anxious about whether or to what extent appeals to 'embodiment' can perform serious explanatory work. As Clark (1999, p. 345) diplomatically put it, 'There is clearly a shift in thinking [about cognition] but the nature and importance of the shift is surprisingly hard to pin down. What is "Embodied Cognitive Science" . . .?'. In his field review, Anderson concurs more candidly: 'It is clear that [EC] has yet to settle on a shared account of "embodiment": indeed, there is little explicit discussion of its meaning, as if it were a simple term in little need of analysis. [. . .] It is incumbent on the field to say something substantial about its meaning' (2003, p. 103). A common response from its apologists is that EC is still a fledgling research programme, in which case we should not (yet) expect it to provide such nuanced explanations and analyses, and should at the very least be tolerant of any disunity or opacity in its vocabulary, procedures, and theoretical commitments (Shapiro, 2007). On the contrary, the time has come to stop apologizing, and—as Anderson rightly acknowledges—start saying something more substantial.

My intention here is that the way to long-term progress is to start correcting an imbalance of research. Specifically, mounting experimental evidence has given EC momentum in fleshing out theoretical problems inherent in the separation of mind and body; yet, the more that proponents of EC compile experimental evidence, the more the fundamental concepts of EC remain in the dark.[2]

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[1] Surely not, for much the same reasons that water is not a consequence of H_2O or that mean molecular kinetic energy does not cause heat.

[2] For example, given the wide scope of EC research, 'grounding' has come to refer to an n-place relation that holds of perception, action, language, and virtually all other psychological phenomena. Our over-exuberance about the phenomena of which such an n-place relation might hold has led to GROUNDING designating a rather unconstrained relation. And the danger in being unconstrained is that the construct ends up as being so powerful that it magically explains everything.

This conundrum is nicely exemplified by Pecher and Zwaan's (2005) *Grounding Cognition*—an edited collection of 12 new articles by prominent researchers in the field of EC. This book aims to programmatically showcase an array of empirical results and analysis alluding to the interdependence of perception, action, and language. Its successes in this endeavour nicely epitomize current directions among the various research provinces of EC. Psychologists interested in EC are sure to find something of interest here, given the strong merits of individual chapters and the range of topics covered. The drawback, however, is that such successes are symptomatic of the disproportion between experimental progress and theoretical clarification. In particular, GROUNDING—now one of the theoretical cornerstones of the EC movement—remains unilluminated. A major lacuna of the volume as a whole, then, is that it fails to articulate just what the grounding relation *is*. Subsequently, this volume exemplifies the need for a new direction in EC. Now more than ever, concepts like EMBODIMENT and GROUNDING are in dire need of some plain old-fashioned conceptual analysis. In that sense, EC is grounded until further notice.

From embodiment to grounding: More than just a shell game?

The volume leads with Borghi's ambitious 'Object concepts and action; which attempts to marshal evidence for a thesis about the relation between concepts and sensorimotor activity. The evidence is a stout collage of neo-Gibsonian work on affordances, ventral/dorsal streams of visual processing, eye-tracking and neuroimaging results, controlled linguistic judgments, *etc*. But what *is* that thesis? It is difficult to ascertain, for Borghi makes use of numerous candidates and rides roughshod over their differences. Each is closely related and occasionally the differences do not make much of a difference; yet, the various candidate theses are not merely alternative ways of stating the same thought. Some are speculations about the nature of concepts *simpliciter*; some are conjectures about the sort of properties that some classes of concepts exhibit; some are claims about words; others are claims about conceptual function, role, or purpose. Hence, the litany of candidate theses makes it difficult to guess which evidence Borghi considers evidence for which claim. Hence, getting clear about Borghi's thesis is necessary for evaluating whether the reviewed evidence establishes what she thinks it does. Whichever ends up being Borghi's thesis, it seems that her concern is properly relegated only to a small subset of object concepts—i.e. manipulable human-scale object concepts of a certain everyday sort (e.g. *spoon*, *pencil*). And extended to more interesting cases, that thesis becomes as increasingly bold and interesting as it does tenuous.[3]

Borghi's contribution does serve to bring into relief a central theme of Pecher and Zwaan's volume: the characterization of the grounding of abstract concepts. This theme is taken up again in Barsalou and Wiemar-Hastings' 'Situating abstract concepts'. They assert four general theses about abstract concepts,[4] and then report on an exploratory study designed to specify the grounded content of nine particular concepts. Barsalou and Wiemar-Hastings take their study to demonstrate several points about conceptual content across different grades of abstraction: that context partially determines conceptual content, concrete concepts pertain to physical objects more than abstract concepts, and abstract concepts exhibit greater amounts of organizational complexity because they appeal to more diverse categories of information. These points are surely correct so far as they go; but how could such a study—which involves little more than a free

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[3] For what 'online simulations' do object concepts like Monolith or Supernova activate? In what sense does the human-scale concept Cyst or Cupola 'support interaction'? Are berth or glacier 'concept-nouns [that] activate motor responses automatically'? And since manipulable human-scale concepts do not exhaust the class of object concepts – much less concepts more generally – it becomes all the more important to recognize which of the above theses should be sloughed off. So it is unsurprising when Borghi herself begins doing just this: 'concepts that do not refer to objects, such as abstract concepts like freedom and truth [. . .] probably do not elicit motor images' (p. 29).
[4] The theses are: (i) both concrete and abstract concepts share situational content; (ii) concrete and abstract concepts differ in situational focus; (iii) abstract concepts are more complex than concrete concepts; (iv) the situational content of abstract concepts could, in principle, be simulated.

association task—possibly demonstrate what Barsalou and Wiemar-Hastings think it does? The authors' reproduction of a representative response *strikingly* reveals that the data consist of untrained undergraduates producing rambling, unreflective answers. Yet, an analysis of that data – however sophisticated – hardly serves as a diagnostic assay of the particular abstract concepts investigated, much less than what the general nature of abstract conceptual content is. After all, concepts like TRUTH, FREEDOM, and INVENTION involve innumerable 'layers' of highly specialized senses and rich substantive conceptual structure (of the sort that many scholars spend their careers trying to characterize).[5]

In any case, the real promise of both Borghi's and Barsalou and Wiemar-Hastings' chapters – i.e. the explication of grounding in terms of simulation – goes unrealized. Borghi's review focuses on motor-based neural activation patterns responsible for simulating interaction with abstract concepts' action-relevant properties, but only ends up concluding that such 'simulated interaction' *assumes* an analysis of GROUNDING, and thus EMBODIMENT (p. 28). And Barsalou and Wiemar-Hastings are concerned not to be misunderstood as having demonstrated evidence for any theses about grounding or embodiment; instead, they conclude with speculations about whether abstract conceptual content could possibly be explained as a function of mnemonic simulations of previously perceived situations. Such speculations are interesting, important, and plausible; and their development is praiseworthy. Just the same, they come with a highly anti-climactic caveat that simply ignores the aforementioned challenges facing EC – namely, to show *how* abstract concepts *are actually grounded* via perceptual simulation in modality-specific bodily systems.

Chapters by Prinz and by Glenberg *et al.* use emotions as a test case to take up this task of suggesting how abstract concepts are grounded actually. The chapters are nicely complementary, though Glenberg *et al.'s* focus lies more with the body's 'influence' on the linguistic expression of affect, whereas Prinz's desire is to continue fanning the flames of recent neo-Humean empiricist work on moral concepts using an updated version of the James–Lange theory of emotions. Prinz's 'Passionate thoughts: the emotional embodiment of moral concepts' begins by spelling out his hardline empiricist view that takes concepts to be stored copies of modality-specific perceptual states serving to encode information about ontological categories in order to produce adaptive behavioural responses. With that background, Prinz defends the following thesis. Moral concepts (e.g. GOOD, BAD) are dispositions that are instantiated in emotions and emotional feelings under certain conditions; in-turn, emotions are commands for action (consistent with many of Borghi's theses), and emotional feelings are noncognitive internal perceptions of bodily reactions to those commands in the presence of external stimuli. Therefore, Prinz argues, abstract moral concepts are grounded in the sense that they are 'linked' to the body via emotions (p. 94). It is a virtue of Prinz's theory that it makes sense of several aspects of abstract moral concepts in an experimentally tractable way; but the most pressing problem is that his theory simply pushes back the question of what, exactly, grounding relations *are*. Prinz mentions linkage—but what relation is that? Prinz likely has a story to tell here—one which fits with his account of moral concepts as dispositions to experience affective states and bodily processes of self-perception. Nevertheless, Prinz—like any proponent of EC—still owes us that story.

In their chapter, 'Grounding language in bodily states: the case for emotions', Glenberg *et al.* describe an interesting experiment that manipulated bodily states during a language comprehension task. While alternating between holding pens with their teeth (to force a partial smile) or lips (to force a partial frown), participants were asked to judge affective valences of sentences. Resultingly, comprehension was quicker by an average of 122 ms for < teeth, pleasant >) conditions, and slower by 45 ms for <lips, unpleasant> conditions. To rule out the confounding possibility that participants' bodily state was interacting with rating the valence of affective sentences rather than comprehension of their emotional content, the authors

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[5] A follow-up study focusing on GROUNDING or EMBODIMENT itself – rather than TRUTH, FREEDOM, or INVENTION – might very well be fruitful.

executed a further experiment asking them to rate the ease of comprehension and timing their responses. The results of this second experiment were a bit muddier, but nevertheless contributed to the indication of an overall interaction between pen × sentential valence conditions. On the basis of this evidence, insofar as manipulation of emotional state by facial configuration is a reliable indicator of whether comprehension of affective language is facilitated by bodily state, Glenberg *et al.* cautiously defend what they call the 'strong embodiment claim' about emotional language comprehension – namely, that it is grounded in bodily states.[6] To their credit, Glenberg *et al.* do attempt some clarification that goes beyond other writers' enigmatic '*x* is grounded in *y*' claims; they write, 'understanding of language about emotional states requires that those emotional states be simulated, or partially induced, using the same neural and bodily mechanisms as are recruited during emotional experiences' (p. 120). But now the same problem seems to recur. Whereas some like Borghi and Barsalou and Wiemar-Hastings explain simulation in terms of grounding, Glenberg *et al.* explain grounding in terms of simulation. Further, their 'strong embodiment claim' turns out to be rather pallid: it amounts to a single necessary condition (i.e. simulations by neural mechanisms are necessary for emotional language comprehension), and, furthermore, does not obviously apply to certain abstract concepts at that. Hence, even if their evidence offers (provisional) warrant for the *existence* of grounding relations, much more detailed analysis about the nature of grounding is needed.

Many chapters focus on the putative grounding of language in perception, and virtually all take the analysis of grounding relations for granted. In their 'On the perceptual-motor and image-schematic infrastructure of language', Spivey *et al.* argue that perception, action, and language interact and/or interface by sharing common representational formats, and adduce a wealth of compelling evidence for the interaction of linguistic and spatial representations (e.g. that verb comprehension influences image-schematic encoding of visual stimuli). Yet, establishing that perception, action, and language 'interact', 'interface', or are 'interdependent' – *even if true and backed by a wealth of evidence* – does nothing to elaborate what that interaction, interfacing, and interdependence consists in. Again, such claims are mere placeholders for more informative accounts of grounding such that it relates language and perception. Both Carlson and Kenny's 'Constraints on spatial language comprehension', and Zwaan and Madden's 'Embodied sentence comprehension' likewise focus on language comprehension. The research presented is highly interesting and provides a great evidential corrective to CCC; yet, once again, GROUNDING and EMBODIMENT serve as little more than a backdrop for both chapters.

Cognizers' imaginative abilities to variably construe situations for expressive purposes are another central theme of Pecher and Zwaan's volume. Zwaan and Madden, for instance, propose that concepts are massively interconnected 'experiential traces laid down in memory' during perception and interaction, which originate with association mechanisms of Hebbian learning (p. 227). Following Langacker, these experiential traces are taken to then be used in construal, where 'construal' is defined as the mental simulation of an experience conveyed by an attention frame. Three other chapters address the relation between embodied experience and these imaginative abilities Gibbs's 'Embodiment in metaphorical imagination', MacWhinney's 'The emergence of grammar from perspective', and Langacker's 'DYNAMICITY, FICTIVITY, and SCANNING'. All three chapters are founded on the commitment to linguistic expressions being important sources of evidence for explaining the bodily basis of mental phenomena. Langacker's chapter presents a synoptic view of his cognitive linguistic research on three important concepts relevant to the analysis of the 'mental gymnastics' pervasive in cognition: DYNAMICITY, FICTIVITY, and SCANNING. Gibbs' article summarizes his previous work on the

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[6] In addition to not establishing whether the manipulations of facial configurations reflect interference as well as facilitation of language comprehension, they note two failed pilot studies attempting to establish a neutral condition (holding pen either with hands or between knees); their second reason for caution involves the consistency of their evidence with claims other than that of strong embodiment.

relationships between metaphor, imaginative abilities, and embodiment. By appealing to several well-worn metaphors and idiomatic expressions, as well as some anecdotal evidence, Gibbs makes a suggestive case for the existence of a relation between bodily states and the imaginative abilities required for mapping from source to target domains. The evidence from metaphors is fascinating, but yields no insights as to the nature of that relation. Indeed, from his definition of 'embodiment', which is often synonymously used with 'grounding' and 'grounded', one is tempted to infer that Gibbs would simply assert that the ground of cognition is some sort of three-way interaction between brain, body, and environment (p. 67). Needless to say, such assertions exemplify why proponents of EC have the theoretical problems they do. MacWhinney's chapter aims to show that perspective-taking is the common denominator for 'knitting together all of cognition' (p. 199). He uses an instructive range of technical examples (e.g. clitic assimilation, syntactic ambiguity, reflexivization, pronominal coreferentiality), but once again, no informative elaboration about what grounding relations are, or how appeal to them might clarify the concept EMBODIMENT, is forthcoming. The difficult conceptual work on this point is left for others, though – more than most – Langacker's chapter picks up some of the slack here. He is generally careful about precisely defining his terms according to their usage within the theory of Cognitive Grammar – e.g. the technical term 'ground' is conceived of as a tripleton {speaker(s), hearer(s), immediate speech event} and used in the specific sense relevant to that programme.

The volume's last chapter, Goldstone *et al.'s* 'Connecting concepts to each other and the world', makes for a curious addition – highly interesting unto itself, but fairly peripheral to the main aims of *Grounding Cognition*. It presents a connectionist model ('ABSURDIST') for addressing issues of incommensurability and translation between any two conceptual systems A and B by employing formal constraint satisfaction algorithms that are said to specify when two individuals possess the same concept. Basically, ABSURDIST works by uncovering correspondences between conceptual elements $\{x, y\}$ via matching and maximizing the similarity relations of their conceptual roles $\{R_1, \ldots, R_n\}$, such that $x \in A$ corresponds to $y \in B$ iff $R_x \equiv R_y$. High activation of network units is treated as a measure of consistent translation between conceptual systems. As with other formal models of meaning based on interdefinability patterns among arbitrary symbols (e.g. HAL, LSA), Goldstone *et al.* claim that semantic value obtains merely via alignment among interdefinable network elements; of course, this leaves open the question of whether such values are, in part, determined by their correspondences to the external world (i.e. 'grounded'?). Rather than taking internalist and externalist accounts of meaning to be mutually exclusive, the authors sensibly endorse a synergistic perspective: models like ABSURDIST show that purely within-systems translation is possible without invoking correspondences to the world, but that external grounding (i.e. 'extensionalist semantics'?) increases translational efficacy and reinforces the partitioning of (non-)correspondences.

What is the concept Grounding a concept of?

The aim of Pecher and Zwaan's (2005) *Grounding Cognition* was to shed some light on the subject of how cognition is grounded. What it achieves is a demonstration that EC is, unfortunately, all trees and no forest. On one hand, the volume does a great job assembling an impressive array of experimental and linguistic data about the relationships between cognition, perception, and action – the effect of which is to indicate that CCC is an unviable research programme. Some of the chapters might even involve benchmark advances. On the other hand, such evidence needs to be 'grounded' in more adequate theoretical foundations. That the very concept of grounding itself turns out to be *theoretically opaque* (and thus inadequate for illuminating the relation of embodiment) is exemplified by the fact that the level of overall clarification does not much exceed that of the dust jacket: 'recent developments in cognitive science view cognition no longer in terms of abstract information processing, but in terms of perception and action. In other words, cognition is grounded in embodied experiences'. Being an anthology, this is certainly pardonable. Nevertheless, the introduction misses a great

opportunity to provide some real insight here, for nowhere is there any discussion of what is meant in uttering the phrase 'cognition is grounded in embodied experience'. Consequently, the volume takes its place among an ever-growing list of texts that inadequately specify what GROUNDING – or any of the other fundamental concepts of EC – is the concept of.

Hence, what is needed is a prequel to *Grounding Cognition* – one that generates an account of the nature and scope of grounding relations themselves. For instance, one might suggest an error-theoretic account, according to which the very idea of there being a metaphysically distinct grounding relation – one which stands alongside correspondence relations or other structural 'mappings', identity, supervenience or asymmetric determination relations, various types of entailment, causation, *etc.* – is irretrievably doomed from the outset. On an error-theoretic view, nothing actually answers to the term 'grounding' – we just talk *as if* there were because such ways of talking are convenient. But then, our theories about the relationships between perception, action, and language are better off by positing relations that are better understood and can be more precisely articulated and analysed, such as supervenience or identity. For my part, I think there might be something to this suggestion. Alternatively, one might suggest that GROUNDING designates a very simple relational property of certain mental phenomena that plays an explanatory role in a theory of cognition, but that it is a primitive concept. And because we cannot give revealing definitions of it in terms of clearer or even more fundamental concepts, we should accept that the status and import of basic concepts like GROUNDING is what forecloses on the possibility of providing them with a more profound conceptual foundation. A third approach might be to show how EC's organizing principles are clarified and streamlined by formulating a reductive analysis of the form 'x is grounded if and only if x is F', where F is a relational property of x (alt. 'x is grounded in y if and only if x bears R to y'). Such an approach assumes that understanding what the *nature* of grounding relations consists in will facilitate understanding how it is that cognition is embodied. This is not to suggest that characterizations must take the form of an analytic definition, and whether formalization is necessary is a further (and possibly irrelevant) question; rather, what is important is that proponents of EC give *a* characterization that is insightful or otherwise illuminating. And with a more adequate theoretical understanding, the empirical evidence supporting EC's main theses – like that adduced in the contributions of *Grounding Cognition* – stands to become all the more significant.

In sum, I have noted that EC should be situated and evaluated within the context of the old mind/body problem, that it faces several challenges when so situated, and that attempts to meet these challenges by using GROUNDING to clarify the positive theses of EC have generally been unsatisfactory. The role of *Grounding Cognition* in all of this is that of being an exemplar: it exemplifies, rather than overcomes, the challenges of generating a positive and informative solution to the old mind/body problem. Of course, this is not to say that the problem is aporetic or insoluble – after all, the store of putative solutions and accounts on offer is well known. Nor is it to say that EC researchers necessarily conceive of themselves as working on the old mind/body problem – many do not conceive themselves as explicitly working on the old mind/body problem though their rational commitments and organizing principles typically tell otherwise. Still, talk of 'grounding' must be adequately characterizable if it is to be useful in scholarly explanations of the interdependence of perception, action, and language. But as a technical construct in a serious theory of cognition, it has thus far been insufficiently clear what the concept GROUNDING is a concept of. Ironically, the lack of clarity – and near-total absence of discussion in some of its main manifestos – about the *nature* of the grounding relation has been an unfortunate hallmark of the EC movement (e.g. Gibbs, 2005; cf. Brisard, 2002). Therein, the explanatory authority of this construct has consisted in little more than incessant *use* of words like 'grounding' and 'grounded' (incessant use which also tends to be incestuously interchangeable with terms like 'embodiment' and 'embodied'). And without this needed clarification, claims of the form 'x is grounded in y' tend to be more limp than limpid.

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Acknowledgements

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