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Wagoner, Brady

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COMMENTARIES

Overcoming Psychology's Methodology: Finding Synthesis Beyond the American and German–Austrian Division

Brady Wagoner

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Abstract Reworking psychology's methodology is of utmost importance if the discipline is to progress. This paper explores methodological strategies which could help overcome the methodological crisis outlined by Toomela (Culture of Science: Strange History of the Methodological Thinking in Psychology. *Integrative Psychological and Behavioral Science*, 2007, doi:10.1007/s12124-007-9004-0). First, I describe a classic research program (i.e., Bartlett's experiments on remembering) that exemplifies the virtues of a "German–Austrian" approach to psychology. Second, I elaborate upon these insights to investigate other aspects of remembering. Finally, I conclude by outlining a methodological programmatic for future research in psychology that overcomes existing forms of experimentation in a new synthesis. The new methodology borrows from both traditions advancing via rich description of single cases and their qualitative transformation to complex theory capable of explaining *all* individual cases.

Keywords Methodology · Remembering · Bartlett · Conversation · Idiographic science

PERHAPS EVERY GENERATION OF PSYCHOLOGISTS has proclaimed a crisis of one kind or another. Vygotsky's Crisis (1987) shows that voicing the concern can be instructive in overcoming it. What is important is not to merely lament over the present state of things but to point out constructively what is missing so that we can creatively put together a remedy. In this way, Toomela (2007) rigorously outlines the shortcomings of contemporary psychology's methodology. Today's inadequacies are shown to us in clear profile against the backdrop of the German–Austrian conception of psychology as a science, which has been largely lost to psychology since the Second World War.

B. Wagoner (✉)
University of Cambridge, Cambridge, UK
e-mail: bw249@hermes.cam.ac.uk

The task that stands before us is one of overcoming existing forms of experimentation (both past and present) by developing new methods and theoretical ideas so powerful that they cannot be ignored by the mainstream. One way of going about this is to look back at some of the classic experiments in psychology in search of tools that may be appropriated for the discipline today. Our aim is not the mindless copying of the great predecessors but rather a careful and intelligent adaptation of their insights to our own questions.

My contribution here will be twofold: (1) to present a concrete classical example of a productive program of psychological experimentation which exemplifies the virtues of the German–Austrian orientation—outlined by Toomela in his eight dimensions of difference; and (2) to develop the insights from this example for contemporary use sketching out a new methodology of experimentation that borrows from both German–Austrian and American approaches. In this way I will look to the past for ideas to help rebuild the discipline today. The psychologist I intend to consider is not German, nor did he belong to any other country in continental Europe. In fact, he was English, though very much steeped in the continental tradition.

Bartlett's Methodology for Studying Remembering

Frederic Bartlett came to be the most influential English psychologist of his time. Though he is appreciated for diverse contributions to psychology I will focus on his most famous work *Remembering: A Study in Experimental and Social Psychology.* While reading *Remembering* (1932) one is struck by the wealth of rich data, the detailed qualitative analysis of whole single cases, and the multiple layers of theoretical interpretation. We find ourselves in a different world of psychology, in which a foreign set of assumptions about psychology as a science are at work. Yet they do work—we come away at the very least intrigued and in many cases convinced. The brilliance of *Remembering* is its simultaneous closeness to the phenomena, through unprocessed data (e.g., several complete reproductions of a story remembered by a subject), and at the same time, a rigorous analysis of it for the development of complex theory that takes into account *all* individual cases. In what follows I will show by what methodological strategy Bartlett was able to accomplish this feat. Though he used a variety of methods for studying remembering, I will concentrate on one of his earliest and best known, *the method of repeated reproduction*.

Bartlett was not the first to use the method of repeated reproduction though he used it more productively than those who came before and after. This was a result of his distinctive style of analysis, in which he concentrates on qualitative transformations in individual cases in search of processes common to all cases. His method of repeated reproduction can be understood to take place in four steps:

- First, a *series* of reproductions is created.
- Second, the series is analyzed for what is *added*, *deleted* and *transformed* from one reproduction to the next.
- Third, general trends of change are identified.

- Fourth, comparisons with results from other experiments and phenomena in the world are made to create or alter a general theory that will apply to *all* individual cases.

These "steps" are my invention, for the purposes of a clear explanation of the method, and as such should not be thought of as rigidly fixed or as the exact order in which Bartlett must have followed in implementing his method; rather it is best to think of them as a formal structure to *guide* inquiry, not *determine* it. Each step will be treated in turn:

First, the basic idea behind the method of repeated reproduction is quite simple. A subject is shown some material, e.g. a folk tale or graphic symbol, and then at increasing time delays he is asked to reproduce it. Thus, we are left with a single individual's series of reproductions, branching out from the original material. The following is an example of data produced using the method of repeated reproduction for the story *War of the Ghosts* (though not of the subject's full reproduction which Bartlett includes):

> *The Original*
> He told it all, and then he became quiet. When the sun rose he fell down. **Something black** came out of his mouth. His face became contorted. The people jumped up and cried.
> He was dead.
> *First Reproduction (time after reading story not given)*
> It was nearly dawn when the man became very ill; and at sunrise a **black substance** rushed out of his mouth, and the natives said one to another: "He is dead."
> *Second Reproduction (nearly four months later)*
> Then, I think it is, the natives describe what happened, and they seem to have imagined seeing **a ghost** coming out of his mouth. Really it was a kind of **materialization of his breath**. I know this *phrase* was not in the story, but that is the idea that I have. Ultimately the man died at dawn the next day
> (Bartlett 1932: 70–71, bold added)

Both pre- and post-Bartlett researchers have employed the methods this far to produce a series of reproductions. However, we will see in what follows that this is not far enough, that a distinctive style of analysis is now required.

Second, to analyze this series Bartlett attended to what was *added, deleted*, and *transformed* from the original to first reproduction and from one reproduction to the next. In doing this he was reading *between* reproductions and thus treating the series as a single movement. To take just one example of this kind of analysis, look at what happens to "something black" (in bold): From the original to first reproduction the "something black" becomes the slightly more concrete "black substance." In second reproduction it is transformed in two directions: one being what is remembered and the other being an interpretation of this element. With this reproduction the subject gives the story a clear supernatural element, but one that is intelligible to the English and differs significantly from the original. We have grown up with ghost stories, but not with stories that end with black substances coming out of the mouth. It is also interesting to note that this supernatural element must be rationalized; it wasn't really

a ghost, just "the materialization of his breath." This interpretation tames the story—the supernatural element becomes an illusion.

In contrast to Bartlett's sensitivity to individual cases and qualitative transformations (Toomela's first and fourth dimensions of difference), recent replications of Bartlett's experiments have *conventionalized* the analysis toward the mainstream American practices of quantitative methods and mean sampling. Consider Roediger's (2000) recent use of the method of repeated reproduction codes reproductions for "distortions" and "accurate" recall. The number of distortions and accurate pieces are then calculated and averaged for each time delay, i.e. 15 min, a week, and six months (see Fig. 1).

There are two major problems with this data presentation: (1) individual subjects are lost in large samples and (2) analysis of intermediate forms becomes impossible. The mean scores for each time condition isolate these intermediate forms from each other; no avenue for pursuing an analysis of *qualitative transformations* remains open. All qualitative transformations are hidden behind the quantitative analysis of the number of distortions and accurate recalls. To access transformations we have to begin our inquiry with individual cases and their change in time as Bartlett did. Furthermore, in lumping subjects together Roediger et al. (2000) is blind to exceptions to the average. Take the unlikely, though possible, case that subject remembered the story more accurately after a week. This would be an extremely insightful case to further analyze (from the standpoint of ideographic science) which would be totally ignored by Roediger and colleagues analysis.

Third, after a thorough analysis of individual cases Bartlett proceeds by identifying general trends seen across his subject pool. For example, in all cases he notices that the "form" of the first reproduction persists through later reproductions, unless significant time elapses between reproductions (such as a year). The first reproduction seems to solidify the story in a tangible form—the most significant transformations occur from the original to the first reproduction.

Another important aspect of the analysis at this stage is highlighting and offering explanations for the most common and most interesting transformations and omissions. To take just two examples, all subjects at one time or another replaced

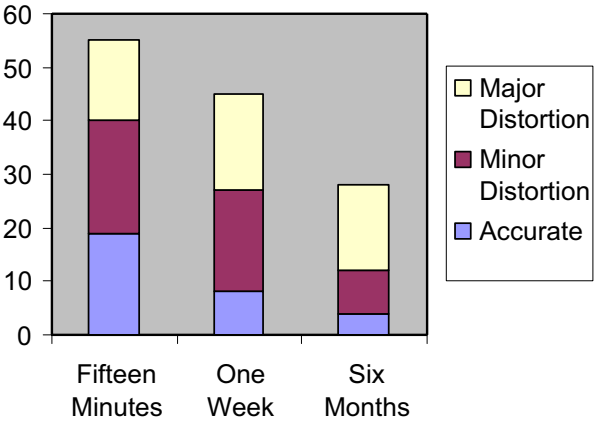

Fig. 1 A strictly quantitative analysis of data obtained with the method of repeated reproduction. *Note*: modified after Roediger et al. (2000): 127

"canoe" with "boat," and proper names suffered significant change and then dropped out completely in all but one case (ibid: 82). It is interesting to note that this single exception to the general rule is not discarded as an irrelevant fluke. Bartlett devotes an entire page to explaining and integrating this odd case into his general theory of remembering in a later chapter (p. 208–209): He uses it to show the importance of images along with schemata in reconstructive remembering, which I will speak of in more depth in step four.

Here simply take note of Toomela's fourth dimension of difference—attending to exceptions—is illustrated in Bartlett's work: He understands that deviance from the norm can be just as revealing as identifying the norm itself.

Fourth, throughout the third stage of analysis Bartlett has been making links between his other experiments. In fact, some categories of general analysis, such as "inventions or importations" (p. 90), seem to be included precisely for this purpose. However, no systematic theoretical synthesis is attempted between experimental findings. His general theory of remembering, or we might go as far to say theory of *mind* or *consciousness*, was only explicitly formulated much later after he had recognized that Head's theory of schemata (see Head 1920) could offer an alternative to a trace theory of remembering. In what follows I will outline Bartlett's general theory of remembering, while making reference to some of the findings that convinced him of its appropriateness. The concept "schema" has been used by innumerable researchers since Bartlett in diverse ways (e.g., Neisser 1967; Minsky 1986; Shank and Abelson 1977). The intent of this article is to explore Bartlett's methodology and as such I will concentrate only on his use of the term.

Schemata

Schemata are active, developing, unconscious structures involved in all psychological operations—contrast this with the most common explanation of his time that said operations were the combination of individual sensations. In the case of imagining, thinking and remembering construction occurs at a distance from phenomena in the world but still occurs through schemata; Bartlett says we "turn around on our schemata" when we perform these operations. When Bartlett's subjects repeatedly remembered *War of the Ghosts* the story looks less and less like the original Native American ghost story and more and more like a conventional English ghost story.[1] The whole narrative structure changes and details like "hunting seals" are transformed into more familiar activities such as "fishing." Schemata *mediate* our relation to the world and in so doing transform the world in a given direction. Similarly, at the sociogenetic level Moscovici (1961) found that when psychoanalysis was first brought to France the then *unfamiliar* activity was represented by the Catholic media as being like the *familiar* activity, confession. By representing psychoanalysis in this way certain features, such as "the talking cure," were highlighted while others, such as the centrality of sexuality, dropped out.

[1] I have used *War of the Ghosts* for many of my own experiments eighty years later in the same university as Bartlett (i.e. Cambridge) and now find the story transforming in the direction of typical Hollywood Ghost stories.

Knowing presupposes the use of socially derived tools which transform their object in the process of mediation.

Imagery

Something is still missing from this theory of remembering: if remembering was determined by schemata alone our memories would quickly become abstract reproductions of existing conventions. No subject, for example, should ever remember the proper names "Egulac" and "Kamala." Another mechanism must be at work which constrains the *abstracting* character of schemata through a *particularizing* process, a process that preserves the concrete details of an event. *One* subject, in fact, remembered at first *only* the proper names "Egulac" and "Kamala," while every other subject (N=20) dropped them by the second reproduction. Bartlett does not dismiss this single subject as an irrelevant fluke but uses her to elaborate the second factor involved in remembering, what he calls *imagery*. We also know from Luria's (1987) study of the incredible mnemonist "S." (who could remember Italian verse flawlessly 15 years later without intermediate rehearsals and without knowing how to speak Italian) and Yates' (1966) illuminating history mnemo-techniques the power that imagery has in capturing concrete details and thus helping us to perform amazing memory fates.[2] These studies fortify Bartlett's claim that two parallel processes are involved in remembering (one abstracting and the other particularizing) and further show that we can train ourselves to exaggerate the influence of the second.

The Germanic Englishman

Before finishing this section let us take a moment to highlight some of the German–Austrian principles operating in Bartlett's methodology: (1) Bartlett is clearly giving a *qualitative* analysis of his data, which is the only way to capture *transformations*. (2) He took into account subjects own *experience* while doing the experiment. This information was used as data to help interpret subject's reproductions and create general theory. (3) The process of remembering was taken to be an activity bound up with both biology and society but irreducible to either. Bartlett was critical of the Ebbinghaus's method precisely because it separated parts from the whole—in this case, from meaning and society. (It should be noted that Ebbinghaus, though very German, fits the model of a very American psychologist by Toomela's criteria). Bartlett created a method diametrically opposed to him, in that it attempted to access and analyze remembering as it occurred in everyday life with all of its complex interrelations. (4) Detailed analysis of single cases were given, including those that contradicted the norm. (5) Bartlett tended not to use personality traits as an

[2]Obviously, neither Luria and Yates had published their work while Bartlett was writing. Allusion to their studies here was simply intending to show the potential fruitfulness of interdisciplinary comparisons of findings. Both Luria and Yates' studies should not only support Bartlett's identification of a mechanism in remembering but also help elaborate the character of the mechanism.

explanation of his results. At most he would make the distinction between "visualizers" and "vocalizers." More often he would employ more dynamic descriptions of subjects which included their particular interests and ideals and those that they share with the group. (6) The goal of *Remembering* was not to *predict what* a person will remember but to explain *how* we remember. For example, he was not interesting in showing what kind of person will remember "boats" instead of "canoes" or under what circumstances unless this helped in understanding the process behind the transformation. (7) Bartlett would frequently use results obtained from one of his experiments to analyze another experiment in order to work out a general theory that encompassed them all—his diverse experiments in perception and imagination were all attempts to work out a single theory. (8) *Remembering* is a masterpiece of psychology which took many years to think through. In it he forges connections between anthropology, biology, sociology, philosophy, and psychology. Such development and originality requires much concentration, deep thinking and patience seldom found in the contemporary discipline which demands frequent publications of statistically significant results.

Expanding the Method

Bartlett showed the effects of repeated reproduction on the remembered story—how a story is transformed in a particular *direction* as a function of one's interests and group membership. From the transformations occurring across reproductions he inferred mechanisms of mediation at work in remembering. As a supplement and extension to Bartlett's work, in this section, we will focus on transformations in the course of a *single* reproduction session. By what process does the subject bring about changes in the story in the concrete *act* of remembering? What means are used in recall and what function do they play in steering the direction of transformation?

A conversational addition to Bartlett's method of repeated reproduction was created to answer these questions. Subjects were asked to "*discuss* and write down the story you read earlier as accurately as possible." In conversation we often answer speak spontaneously to our interlocutor, without thinking before we speak. In fact, it is common to see subjects ask a question to their partner and answer it themselves before the other gets the chance. They also make a statement and then immediately supply their own counter argument to it as if they were in debate with themselves. Speaking to another often shifts to speaking with oneself. This being so, conversation is then a legitimate medium to observe thinking as it occurs in real time; speech is the "objectification" of thought displayed to the researcher for analysis (See Mead 1934 for a philosophical defense of language as a medium to study mind).

Using the conversation method it was found that remembering would at times flow smoothly out of the subjects, from one to the other, while at other times a *rupture* would occur, which required a deliberate act of *confabulation* in order to mend it. Figure 2 outlines these different directions remembering can take. In remembering a story, for example, each part of the story might be clear enough that I can move effortlessly from beginning to end; however, it is more likely that I will be

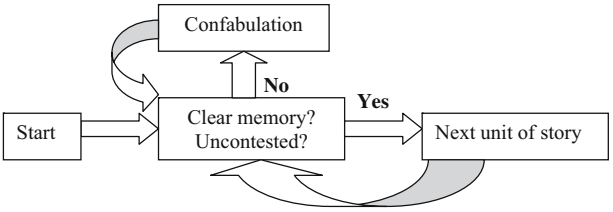

Fig. 2 Processes of remembering

confronted, at several places, with an unclear memory in need of elaboration.[3] When this occurs I pause and began to consult my cultural conventions to establish what *might* or *should* be in the missing spaces of my memory. I may even produce several *possible* sceneries and then choose the one that *feels* best. My interlocutor will also affect this process by either working harmoniously with me (e.g., filling in an incomplete sentence of mine) or alternatively expressing doubt or contesting my memory, in which case co-constructive confabulation and argumentation begins.

The process of confabulation (i.e. of *rupture* and *reconstruction*) is our primary interest here. Specifically, we want to know how subjects overcome uncertainties in memory—how they continue to construct a coherent story despite the missing pieces. To explore this question consider the conversational reproduction and the transformations occurring inside it, as well as between the reproduction and the original.

The original story:

"He told it all, and then he became quiet. When the sun rose he fell down. Something black came out of his mouth"

The first conversational reproduction:

Bill: He told his story and then became quiet. Right? And then *the sun sets ... or something*
Henry: Well, *he goes to sleep*
Bill: It didn't say anything about sleep. In the morning he *stood up* and died
Henry: *Woke up* and died
Bill: All right, so he became quite after telling the story. Ahh, a photographic memory would be awesome right now. Ok now we're to the point were *he woke up*. Did they say *he woke up*?
Henry: I don't think *he stood up*
Bill: I thought he
Henry: I don't think *he stood up.* I think *he did wake up*
Bill: Ok, so *he woke up* (writes). Something black
Henry: came out of his mouth...

[3] I deliberately avoid the contemporary language of memory research which emphasizes "distortion" and "errors" (as used by Roediger et al. 2000, see above). From my perspective the same phenomena can be labeled "elaborations," "expansions" and "additions." By doing this I focus on remembering as a *constructive* process rather than a faulty cognitive faculty. The first approach may be legitimate for applied research but will falter in developing a solid theory of remembering as a social and constructive process.

Bill and Henry easily remember the parts *before* and *after* the phrase "When the sun rose he fell down" but they must *confabulate* to remember what occurs in-between these clear accessible memories. Though the original says nothing about "sunsets," "woke up," or "sleep" these ideas are formed out of the vague memory of the transition between night and day. We can see that bits of the original still linger in their conversation but are radically reconstructed through confabulation. The outstanding details (what we might call "imagery" following Bartlett) and a vague schematic memory of the scene (it takes place at night in transition to day) must somehow be brought together. The pair does this by making use of American conventions surrounding night and day (people *sleep* at night and *wake up* in the morning) as well as through metaphorical transitions (e.g. the different uses the embodied *up–down* dichotomy).

If we outline the series of transformations, occurring through the interplay of imagery and schemata (see Fig. 3), we see that there are three interrelated mechanisms of transformations:

(1) time period into conventional activity;
(2) a down-to-*up* activity into a different down-to-*up* activity; and
(3) an activity into its opposite.

Before exploring each in turn I must emphasize that these mechanisms are *systemically related* in their facilitation of transformations. For example, the final synthesis into 'woke up' might not have been possible without *both* mechanisms (2) and (3).

(1) We have already discussed the power of conventions to shape thought in Bartlett's original experiments as well as in Moscovici's famous study of psychoanalysis. Here we clearly see the process of mediation by conventions (or social schemata) in conversation as they are used to fill in gaps in the story recall. Both subjects put forward *possible* accounts of what happened—both wrong—from the standpoint of what conventionally does happen at these particular times of day. Our conventions create a space of potential objects which can then be used to integrate a fragmented memory.
(2) Lakoff and Johnson (1980) bring to our attention *orientational metaphors* that "organize a whole system of concepts with respect to one another" (p. 14). They give the example:

Consciousness Is Up; Unconsciousness Is Down

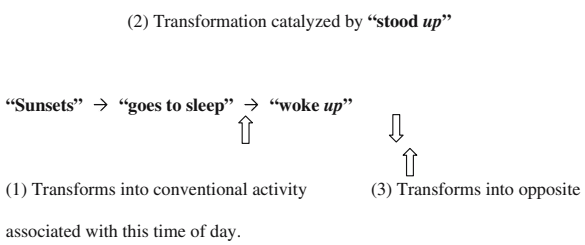

Fig. 3 Outline of the chain of meaning transformations in the dialogue above

This provides the framework for the following expressions: "Get *up*. Wake *up*. I'm *up* already. He *rises* early in the morning. He *fell* asleep. He *dropped* off to sleep. He's *under* hypnosis. He *sank* into a coma" (p.15). The physical basis for these metaphors can be found in the fact that humans sleep laying down and stand up when awaken which has an element of physical convention in it as well. Returning to the analysis of the conversation the reader will be reminded that the original states "the sun *rose* and he fell down." Neither Bill nor Henry arrive at this specific statement but both struggle to capture the down–up movement within the context of night turning into day: Bill says, "he stood *up*" and Henry argues, "he woke *up*." The structuring dichotomy down-to-*up* remains though the specific contents are lost.

(3) Much has been recently written on the *unity of opposites* (see especially Josephs et al. 1999; Marková 2003). Suffice it to say here that ideas do not flow at random in one's stream of thought, nor do thoughts move through associative bounds; instead, ideas are structured holistically in pairs or trios. Take the simple experiment of Selz who asked subjects to report a "coordinated" concept to the word "death." One subject answered "life" and gave the following retrospective report: After some reflection, "life" came to mind as the solution. Before that I had formulated the question in unclear words: 'What is co-ordinated with death?' The solution came to mind as something familiar (Quoted in Kusch 1999: 65). As with Selz's subject, a whole complex has already been mobilized by Bill; it is a short step, for him, to move to the *familiar* opposite of "sleep," "wake up." Opposites belong to the same complex—they share much more in common with each other than they do to other ideas and as such frequently transform themselves into their other part.

The methodology used in the above analysis has stayed true to a thorough examination of rich single cases. From single cases we derive the mechanisms that drive and constrain transformations of social forms. In the same way that natural selection explains the changes that occur in organisms over many generations, in Darwinian Theory, we search for an explanation of the changes of thought that occur in a single conversation oriented toward remembering a story. Here we have focused on a small segment of conversation in which transformations through confabulation are occurring. Like Bartlett's use of the method of repeated reproduction, we were not content to merely *describe* changes; we sought an *explanation* for them by going deeper. This was achieved by reading *between* transformations in the remembered object (e.g. "sunsets" to "he goes to sleep") as well as from the original to understand the general mechanisms guiding the change. To further advance our analysis we would apply the mechanisms identified above (i.e., conventions, metaphor, and unity of opposites) to other remembering conversations to both test and elaborate our theory of transformations in remembering. The methodological movement is from *single case* to *generalization* back to *single case* and so on (Valsiner 2003). Through this analysis we should be able to step-by-step develop, refine, and relate the processes at work in thought transformation of an object, such as a memory.

Overcoming Existing Forms of Experimentation

Human psychological phenomena are *systemic*, *dynamic*, and *social*. By *systemic* I mean that the parts of an organism are connected together in complex relationships. To understand any single part it is necessary to understand the system in which it is embedded. Thus, the current mainstream methodology of isolating variables and analyzing their affects as group averages is untenable. In studying parts separate from the whole this approach breaks the systemic links between variables and thus can tell us nothing about the holistic functioning of the person with her environment. In *Remembering* Bartlett comments, "Statistical methods are, in a way, scientific makeshifts. They are devices for handling instances in which numerous conditions are simultaneously operating. They do not show how all these conditions are related, and by themselves they throw no light on the nature of the conditions" (p. 7–8).

A systemic approach can be *dynamic* or static. To make it dynamic we must from the outset assume that change is the name of the game. The question of "what is?" needs to be replaced with "how do things *change* or *maintain* themselves as the same." Most psychological studies are content to merely point out differences between two static groups. They do not recognize that individuals within a group are themselves variable in respect to time and each other (Molenaar and Valsiner 2005). Even longitudinal studies are a product of the static orientation; they merely create a series of static snap shots (much like Roediger et al. 2000 study criticized above) rather than trying to work out the coordinated system of changes.

Finally, all psychological operations—whether they are perception, attention, thought, or remembering—are infused with the *social* (see Vygotsky and Luria 1994). The social process, when added to the dynamic psychological system, reorganizes all parts already existing by creating a new whole. A mind is bound up with the society to which it belongs; Society and mind are systemically linked. However, when the social is studied in contemporary psychology it most often becomes a study of an individual mind within a social context rather than social context in an individual mind. The former approach separates mind and society into two distinct domains; the latter aims to understand their interrelationship or how society gets "inside" the developing person. We can understand contemporary psychology's motivation to split them apart: it makes no sense to consider the social a variable if they cannot be neatly cleaved—mainstream psychologists would by left without tools to study the social.

A methodology that reflects the fact that psychological phenomena are systemic, dynamic and social is desperately needed. In the space that remains I will switch gears and transform my thus far negative critique into a positive alternative. I will sketch a general outline for a methodological program harmonious with the above observations about psychological phenomena. It has already been argued that a careful analysis of single cases is the only way of exploring qualitative transformations, i.e., a coordinated system of changes. But how do we access, analyze and build theory for such phenomena in an experimental situation?

The first step is to create experiments in which a change can be *qualitatively described*. Bartlett's experiments are an excellent example of this technique. The specific detailed findings varied between his experiments but in all cases with all

kinds of stimuli he found change in the direction of increasing *conventionalization*. Similarly, in clinical neurology Luria (1970) began to investigate the nature of his patient's disorder by probing their abilities with simple qualitative experiments. Working within a modified Vygotskian framework Luria conceptualized brain processes as being parts of larger functional systems, e.g., speech is made possible by various brain regions working in harmony with extra brain parts. One had to first explore the surface transformations in functioning before positing which part of the system was impaired. Description of a single case leads to an assessment of an underline mechanism. In the analysis of the remembering conversation a single short transcript gave us a glimpse at some of the processes of transformation occurring in overcoming the ambiguity of a fuzzy memory.

This analysis is followed up by the second step where the mechanisms identified are observed against other single cases. The general model will have to be adapted to the findings of each new case. If one case out of 50 contradicts the theory we will have to rework the theory until it explains the deviant case. We saw one of Bartlett's subjects solve the remembering task in a very different way than all the others. Bartlett uses this contradictory case to explain the second mechanism in remembering, imagery, which constrains the effects of schemata. It is in this step that the researcher gradually works out the existing parts and how they are interrelated; in this case, schemata and imagery are two processes working in opposite directions and thus both supporting and constraining the influence of the other.

The third step involves challenging one's theory through *hypothesis testing.* Because we have not touched on this step yet in the previous sections I will explore it in more detail here. Having worked out a general model of a system and how its parts operate as a whole we should be able to systematically alter the system to bring out predicted effects. The practice of *prediction* is central to the American approach to psychology. Here we have appropriated the practice into single case analysis. Now hypothesizes must be tested at the level of single cases. Luria (1970) after having identified what part of the patient's functional system was malfunctioning, treatment involved giving patients an external mediator to compensate for the faulty part. For example, one kind of patient had extreme difficulty understanding relational expressions, such as "father's brother" or "the circle under the triangle." These patients understood the words in isolation but could not synthesize the two into a single whole, e.g. they understood "father" and "brother" but not the integrated expression. To treat this condition Luria used images that expressed complex relationships to fill in the gap in the functional system. Consider the following iconic external mediator (Fig. 4):

Gradually, patients internalized the mediator such that they could synthesize expressions without the help of the external aid. Luria predicted the *direction* in which a transformation in a system will occur if specific conditions are created. In a similar fashion, Einstein said that his theory of relativity could be tested under the very specific conditions of a solar eclipse. The theory postulated that light rays will bend in a gravitational field. During a solar eclipse in 1919 starlight was seen to bend by the amount that Einstein's theory had predicted.

Once we have worked out a general theory we can design specific experiments to test our model. Returning again to the study of remembering we should be able to

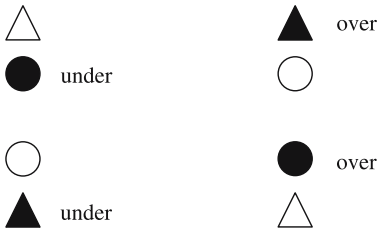

Fig. 4 External mediator acting as prosthetic device to recognize relationships in speech. *Note*: Modified after Luria (1970): 444

predict directions of transformation for a certain stimulus in a particular manner and context of recall. From the sketchy model we already possess regarding the systemic nature of remembering we can at this moment make several predictions:

(1) From Bartlett (1932) we know that material always changes in the direction of one's group conventions. In a specific form Moscovici's theory of social representations predicts systematic transformations in a scientific theory as it is communicated and digested by a public (see Moscovici 2001: 33–36). We saw above how psychoanalysis was represented in French society. Experimentally we could simulate a like process by giving subjects a short scientific explanation of say fertilization of an egg in the ovary. We would expect the remembered explanation to increasing be represented as a social drama, in which sperm and egg have human characteristics, intentions, and male–female personalities (see Bangerter 2000, for a similar experiment which obtained these results).
(2) We could also alter the *means* by which subjects remembered. Subjects could be trained and then asked to form vivid imagery of a story as they read it. Transformation should, if Bartlett's theory is true, occur in the direction of the concrete and in so doing lose continuity between episodes of the story.
(3) Before the remembering task the researcher could ask the subject to read a particular kind of story every day for a month. Saturation in a particular genre of story should then alter the way in which subject perceive and remember stories with certain similarities to the familiar genre. The direction of transformation in this case would be toward the story genre in which the subject had been saturated. For all these experiments the methodological movement is from particular case to general model back to particular case.

The researcher should feel free to move between the three steps. I put them in order to represent that fact that later steps presuppose an understand of earlier ones. For example, it makes no sense to test hypothesizes unless one has worked out a complex theory in which to embed them. At any point the researcher can return to the general phenomenon of interest for a careful descriptive study. Too often psychologists conduct experiments with hypothesizes and variables without really understanding the phenomena in which they are interested. Any science must begin with careful observation before proceeding to general models, which can then be tested.

I must stress once again that at every step of one's investigation the general rule of advancement is by way of thorough analysis of single cases and their qualitative

transformations. The systemic, dynamic and social nature of psychological phenomena dictates this and at the same time assures that transformations will not be random—they will change in a specific *direction* holistically, depending on the system and the stimulus used to activate schemata. The direction of change and transformations at each junction will clue us into the mechanisms lying behind them. Once formulated these can be tested, first against new cases, and later through experiments designed to test hypothesizes. The novelty of this approach is its rigorous utilization of single cases in all their variability in space and time. (In fact, variability becomes the key component in developing one's theory). Just as Einstein's predictions did not need a "control group" to compare with, our focus on single cases provide a self-sufficient object of analysis. In these ways the new methodology will be a radical break from most forms of experimentation previously used in psychology, German–Austrian and American. Only in overcoming methodologies past and present will we develop a rigorous psychology of culture and thought in transformation.

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Brady Wagoner is pursuing a PhD in social and developmental psychology at the University of Cambridge with the support of the Gates Cambridge Trust and the ORS award. His interests include the sociocultural study of remembering, issues of communication and understanding within a dialogical epistemology, and revisiting the history of psychology (and the social sciences more generally) in search of potentially productive theories and methods. He is a co-creator of the *F.C. Bartlett internet archive*, which can be accessed at: www-bartlett.sps.cam.ac.uk. Presently, he is editing a book titled *Symbolic Transformation: Toward an interdisciplinary science of symbols* to be published by Routledge in 2008.