

Journal of Russian and East European Psychology, vol. 49, no. 4,
July–August 2011, pp. 5–30.
© 2011 M.E. Sharpe, Inc. All rights reserved.
ISSN 1061–0405/2011 \$9.50 + 0.00.
DOI 10.2753/RPO1061-0405490401

MICHAEL COLE AND JAMES V. WERTSCH

Freedom and Constraint in Human Action

This article traces the development of the thinking of Vladimir Petrovich Zinchenko from early in his career to the present day. Both the trajectory of the ideas themselves and the various complexities involved in interpreting Zinchenko's mode of expressing them at different times in his career are discussed.

*Those who fail to reread are obliged
to read the same story everywhere.*

—Roland Barthes (1974)

We feel especially privileged to write in honor of Vladimir Petrovich Zinchenko's eightieth birthday. It is indeed a great day for celebration of his exemplary life in science and as a public intellectual of international scope.

This opportunity has induced us to reflect upon our long and unusually deep association with Vladimir Petrovich. We are, so to speak, kin to Vladimir Petrovich, his close friend, Vasilii Davydov, and many of the Russian followers of cultural-historical and activity theory. We share with them, and with others of that generation, the honor of being “third generation” Vygotskians. We, like them, studied with A.R. Luria and A.N. Leontiev. We attended lectures and visited with other key scholars of that generation: Bozhovich, Levina, Morozova, Zaporozhets, Elkonin, Galperin, Zeigarnik, and others. We shared with them too, in greatly

Michael Cole, University of California, San Diego, La Jolla; e-mail: mcole@ucsd.edu. James Wertsch, Washington University, St. Louis, MO; e-mail: jwertsch@wustl.edu.

attenuated form, experience of life in the Soviet Union during and after the Cold War. As officially chosen representatives of American science, we were not subject to the same, draconian, punishments for fraternization that Vladimir Petrovich and Vasilii Vasilevich [Davydov], not to mention the older generation of Soviet citizens, had to endure. But as Americans in Moscow during the Cold War, one of the costs of such friendship was to subordinate oneself to the local constraints as the most elementary condition of friendship. One might be able to bend the rules ever so slightly, but if one happened over a surveillance trip wire, the consequences were extraordinarily unpleasant for all concerned. Such relations, maintained across time and across radically changed global circumstances, bespeak one of the great lessons we learned from our Russian friends and teachers—the meaning of friendship.

At the same time, both of us had professional relations in which we played the roles of “science mediators”—as translators, exchange officials, journal and book editors. And, as happens in the case of such mediators, we have also been willing appropriators of the ideas of Vygotsky and his descendants, whatever the particular kinship relation they claim to each other.

We have also had several decades of experience seeking to explain Russian and American colleagues to each other. That can be an odd experience. For example, our American colleagues have often found us difficult to understand, methodologically anomalous, sometimes overliterary or oddly focused on notions such as cultural mediation, polyphony, and development. Simultaneously, our Russian colleagues often see us as people who have misappropriated those very same ideas, or as people who have failed to understand the fundamental ideas and the intellectual relationships among key figures including Vygotsky, Leontiev, Luria, Rubinshtein, and so on. In short, the American Vygotsky often seems to bear little relationship to the Russian Vygotsky.

The two of us are clearly caught in the middle of these kinds of crosscutting discussions in international scientific discourse surrounding the ideas of Vygotsky and those who claim kinship with him. Consequently, what we offer here is ineluctably going to be, itself, internally dialogic and polyphonic. Vladimir Petrovich, we hope, would approve of this approach to his work.

Finding a common thread

Because Vladimir Petrovich has lived through such different sociopolitical contexts and has covered such a wide range of topics, when we

began to write this essay, we immediately confronted the need to address the problem of what aspect of his work to focus on. The development of perceptual actions and problem solving in small children? The study of eye movements and problem solving among children and adults? The ergonomics of motor control for improving worker performance in highly technical jobs? The nature of human culture and human spirituality expressed in art?

Following the well-known maxim that “to understand behavior we need to understand the history of behavior,” we began to reread Vladimir Petrovich’s work. This rereading began with recent articles on what he refers to as Vygotsky’s “nonclassical psychology.” From there we began to retrace this recent, general, formulation of his ideas, starting with the early publications of the late 1950s and 1960s, when he was working with his mentor, Alexander Zaporozhets. We expected that we would find a common thread within the tangled jargon of each of the specific discourses. And we did. That thread is the study of action as the ideal unit of analysis for understanding the possibilities and limits of human freedom.

In the following pages, we seek to trace the way in which a focus on human action provides a key position for observing, analyzing, and theorizing the transformation of the past into the future, the “given and the new,” “the presupposed and the supposed,” and memory and imagination. Studying human action over time, to use Vladimir Petrovich’s own words, permits us to “characterize life as a dynamic process that vacillates ‘on the sword’s edge,’ between idea and action, consciousness and activity, experience and implementation, affect and intelligence” (Zinchenko, 2002, p. 7). It is in this process of traversing the sword’s edge alive that the potential for a freer and less constrained experience may come into being.

A brief digression

Before embarking on our account of Vladimir Petrovich’s theory of action, seen through the prism of his major research programs, we want to raise a question that fascinated us as we undertook this essay. Why, if it seems so clear to us now, was the centrality of liberatory action not clear to us decades ago when we were translating Vladimir Petrovich’s work and using many of his ideas? Why did we need to traverse Vladimir Petrovich’s journey with his own guide book in hand to make this (now) seemingly obvious point?

Clearly, many factors can legitimately be invoked to explain our limited understanding of Vladimir Petrovich's ideas. Our own limited scholarly backgrounds make it difficult to follow the details needed to interpret research in seemingly quite separate, specialized, cultural domains. The fact that we have always had to deal with subtle issues across two language/cultural traditions biased our understanding toward ideas that most easily resonated with those to which we had become habituated. These and other factors could be invoked as plausible contributors to our myopia.

We believe, however, that some of the credit had to go to the ideology-bound, top-down, command and control, organization of Soviet society. We refer here not to our interactions with Vladimir Petrovich, which went in and out of official favor with those controlling international science contacts, but to the way that he had to write in order to allow his subversive worldview to accrue new, compelling examples. It is equally important to understand the converging constraints and affordances that allowed him to conduct professionally brilliant, socially useful, and approved work at the same time that he could continue to elaborate on his theory of human action and its broad philosophical and psychological significance. These "contextual" factors should be kept in mind as we discuss different manifestations and implications of Vladimir Petrovich's ideas.

The common thread, human action

From early in his career, Vladimir Petrovich drew upon the ideas of Nicholas Bernstein; consequently, his use of Bernstein's ideas is a good starting point for understanding his overall theory of human action. In the 2002 essay, Vladimir Petrovich takes special note of a central property of movement identified by Bernstein, namely, the recognition that "exercise is a repetition without repetition" (Zinchenko, 2002, p. 21). The general point he was making is that when trying to replicate even the very simplest of movements, identical reproduction is impossible; consequently, "some space for creativity, for self-development always exists" (*ibid.*). If we observe simple movements at a sufficiently fine-grained level, we can always see some variation; no two finger taps on a keyboard and no two pronunciations of the same phoneme are ever completely identical, even if we are trying for identical repetition. This tension between repetition and creativity, of course, exists in many debates in psychology, and about human nature in general. On the one hand, to be human is to be

socialized into an existing social order; on the other, to be human is also to construct social and psychological reality in ways that always leave room for variation. Western analysts have had this debate in discussions of the merits of Piaget versus Vygotsky, for example. But it played out in special ways and with especially high stakes in the Soviet Union because of efforts at top-down control of society.

In this context, the work of Vladimir Petrovich and his teachers and colleagues was controversial for a variety of reasons. For one thing, it was clearly a version of the basic ideas of cybernetics that Norbert Wiener had developed in the United States, and because of their origins, Wiener's ideas were ideologically suspect. The nonlinearity of cybernetic systems, and in particular, the need for creativity in all action, both spoke directly against the idea of organizing human life by command and control. There has to be, as Vladimir Petrovich knew in a way that made him a raconteur of anecdotes, some play in the system, for it to remain alive. An exploration of that necessary creative moment, in many realms of human experience, can be considered the core of Vladimir Petrovich's work.

In the following pages, we trace Vladimir Petrovich's work chronologically as a means of displaying the red thread of continuity. To organize our narrative, we divide it into three "phases" distinguished by their specific empirical content, the domain of social practice in which the research was conducted, the theoretical sources being drawn upon, and the political context.

Phase 1: Perceptual actions

A key idea about human action, which Vladimir Petrovich inherited from his mentor, Zaporozhets, is that perception is a form of human action. From this perspective, our eyes actually "feel" the environment in a manner quite analogous to the ways that one's hands "feel for" a handkerchief in our pocket or reach into a shopping cart and pick up objects without looking, so that we have to "come to" identify the object. One does not pick up a bottle in the same way that one picks up a banana; any such action is a form of orientation, a process involving complex back-and-forth interactions of the person and the object. Zaporozhets and Vladimir Petrovich shared the idea that in this process, a unique mental image is formed as a kind of "mental model" of the environment and the person's relations to that environment. The first series of research carried

out by Zaporozhets with Vladimir Petrovich and others of his generation focused on the development of perceptual action using nonintrusive ways to record both eye and hand motions in situations that felt, and were, contrived, but reasonably natural to the children. This research was then supplemented by Vladimir Petrovich's work on stabilized images. We believe that this latter work is best seen as a continuation of the work with children, but at an entirely different scale of analysis.

The development of tactile and visual perception

In a series of experiments begun in the late 1950s, Vladimir Petrovich and his colleagues presented children with irregularly shaped figures that they were asked to explore. After a period of exploration, they were then asked to identify the object from an array in which it was mixed with a variety of other, similar, objects. The children's movements were recorded using a high-speed movie camera.

A number of interesting results were obtained (see Zaporozhets, 1969, for an accessible summary; we use only results from the three- and six-year-olds for purposes of contrast). The youngest children failed to explore the entire object with their hands and fingers; they were most likely to prod it or run their hands over the surface; the six-year-olds grasped the edges of the object and felt along its contours. Subsequently, the three-year-olds were generally unsuccessful at identifying the object when it was mixed among others while the six-year-olds experienced no difficulty.

When the children were asked to explore the object visually, a similar pattern of movements occurred; the three-year-olds focused mostly on the middle of the object with only a few movements toward its contours while the older children extensively traced the contours as well as the overall dimensions of the figures with their eyes.

In subsequent studies, the three-year-olds and six-year-olds were distinguishable in a number of related ways: three-year-olds benefited from engagement of the task in some understandable, practical task, while the older children could do so in the ordinary isolated environment of the laboratory task. The three-year-olds could not identify the objects they had explored in one modality when presented the object in the other modality (e.g., identifying an object felt with the hands when it was presented visually). How then, does the hand know what the eye saw? The answer is that the older children have formed an image adequate to the task. When asked to imagine the object they had been studying

previously, the eye movements of both the three-year-olds and the six-year-olds mimicked those they had made earlier.

All well and good. Here we have a clearly recognizable, contemporary approach to perception and cognition familiar in American cognitive psychology. We also have some interesting information about the conditions that appear to promote the development of image making abilities so we can create curricula that optimize the children's perceptual abilities (image making being a central constituent of perceptual actions). But what have we learned about the image-making process itself? This is a theoretical approach that wants to get to *process*. Environmental design becomes both the means of studying perceptual action and a state-sanctioned way of promoting children's sensory abilities. And these abilities are essential, the texts tell us, to the development of adults with keen capacities to run the complex technology that has become the mode of life and was needed, quite urgently, for the well-being of the nation.

Stabilized images on the retina

Vladimir Petrovich's work on the phenomenon of stabilized images on the retina overlapped with his work with children. On the surface, the two lines of research might appear quite distinct. One line is focused on children and the development of sensory capacities (or so Zaporozhets, 1969, characterized it) while the other focuses on a fascinating and elusive perceptual phenomenon.

Briefly, the facts are as follows: Our eyes are in constant motion, not only as a result of voluntary movements of the eyes and the head, but owing to involuntary saccadic eye movements of 20–200 msec in duration (and even briefer “micro saccades”). Consequently, the eyes move with respect to a stationary object even if maximal effort is made to stare at the object without moving. When visual images are stabilized on the retina using a special apparatus that moves in perfect coordination with the retina, the visual field goes gray, but it does so slowly and the images break up before they disappear. If there is slight slippage, fragments of the image reappear. However, the full image reappears only when there is free play of the image across the retina. The physiological mechanism for the total fading of the image is unproblematic: the cells of the retina respond to changes in luminance so they gradually lose responsivity when luminance is invariant.

Looked at from the perspective of the level of micromovements, eye

movements are central to visual perception of the world. Consequently, the fact that saccadic eye movements are required to maintain visual contact with the world places perceptual action right into the center of the most intimate cognitive capacities of the organism.

These same findings raise a fascinating question: What if it were possible to “trick” the eye into seeing the object even in the absence of any micromovements? Then movement would seem superfluous. There would be no need for the eye to “feel” the object.

Vladimir Petrovich, working with creative technical colleagues, did figure out a way to trick the eye to prolong the image by changing the colors of the images in an appropriate way. In one study, they presented the *Necker Cube* illusion, a two-dimensional drawing of a three dimensional object. The cube not only appears as three-dimensional, but successively appears to protrude from and into the page upon which it is drawn. The subjects reported seeing the cube reverse its apparent three dimensional orientation even though eye movements were no longer necessary to maintain the image. Nonetheless, Zinchenko and Vergilis (1972, p. 18) observed “vicarious perceptual actions” that “perform the successive perception of different areas of the stabilized images.” Based on this evidence, they conclude that “Eye movements thus organize the movements of attention (vicarious perceptual actions) in the visual field even if this field is stationary relative to the retina”—ergo, perceptual movements are part of a cognitive system that can operate in a pattern different from the immediately impinging world (p. 17). They had arrived at “the mind’s eye” where, in their terminology, “the primary function of vicarious perceptual actions with images replaces actions with real objects” (p. 28). The mind’s eye is, again in Vladimir Petrovich’s terms, a “functional organ,” that includes “vicarious” movements.

Each of these conclusions implies that there is a realm of “the psychological,” of “psychological action,” a process that while *in* the world and *of* the world, is not isomorphic to the world. Using terms proposed by Leontiev, this internal world was conceived of as a process of simulation, the products of which mediate subsequent action. The process of creating and implementing that simulation to make it safely into the future constitutes the “sword’s edge.” Here we find the realm of human consciousness.

Phase 1: Summarized

When we put the work with children together with the work on stabilized images in adults we can now see that they indeed bear a clear relation to each

other. The work with children documents a process whereby they are able to form mental images with less and less environmental support; by the time they are about seven years old, they imagine an object (a previously seen odd shape) using the same eye movements they used when seeing that object previously. The externally evident actions of the initial state are displaced, under normal circumstances, by a dynamically changing internal model.

The research on stabilized images demonstrates that among adults, even when images of external objects are perfectly coordinated with the retina, micromovements of the eyes occur. Such “vicarious,” movements, vicarious in the sense of being unnecessary in a physical sense, we might think of as the “mental movements” of the mind’s eye.

In both the work on children’s externally recordable movements of the eyes and hands, and the stabilized image experiments, this process of image formation involves a complex back-and-forth process between organism and environment over time that, like all living movement, *cannot repeat itself exactly*. Particularly in its exploratory phase, an image requires the emergence of something unpredictable, something new, however slight this newness may be. The product cannot be totally controlled from the outside. It is, again, however slight, the margin of free action.

Also central to each of these accounts is the idea that perceptual action is at the heart of the relationship between freedom and constraint in human life. As children develop, they become less “context-bound.” Thought, a millisecond process at its core, separates itself from externally obvious action. But it remains action, with its momentary balancing on the “sword’s edge.” This is the moment of image-making, imagination, that is essential to human life. Taken as a whole, this work is a reminder of how deeply human beings require some “freedom of movement” to function adequately even in the most reduced environments.

This conclusion seems obvious to us now. But it did not seem obvious to us at the time. One of the reasons for this was that we came with pre-conceived ideas about the meaning of technical terms that seemed to play an important role in the thinking of Russian psychologists. This problem applied, for example, to our interpretation of linkages of perceptual action to the idea of an orienting reflex made popular through the work of E.N. Sokolov. As we interpreted it, an orienting reflex is a reaction to a new or unexpected stimulus or to change in the intensity, duration, frequency, and other parameters of the stimulus. The orienting reflex was famously used by Luria in his work on semantic reflexes (Luria and Vinogradova, 1959). A basic property of the orienting reflex is habituation; it disappears

with repeated presentation. If a representation of the stimulus is formed, and subsequent presentations “match,” the response habituates. If there is discordance, the response reappears.

What did this instantaneous “response to change” have to do with children feeling objects over several minutes’ time, trying to figure out what the object might be? Is instantaneous reaction to discrepancy equivalent to lengthy exploration? Primarily, the link between the two forms of behavior is that in 1952 Russian psychologists were forced by the Stalinist regime to adopt Pavlovian language in order to continue working, indeed to survive. They did so by arriving at the ingenious solution of combing Pavlov’s writing to come up with concepts that were superficially equivalent to the concepts they had developed in the 1930s and 1940s. Orienting reflex was one such concept because Pavlov himself had referred to this concept as the “what-is-it” reflex and linked it to exploratory activity.

By the same token, combing the works of Marx and Engels, they chose the concept of activity (*Tätigkeit*) as a means of reconciling their own theoretical ideas as psychologists with the demands of the state for ideological conformity to a regime that sought to provide the ultimate teleology of every citizen’s life. Here is how Vladimir Petrovich wrote about the adoption of the concept of activity by psychologists in the 1930s:¹

For Rubinshtein and Leontiev the category of activity served as a kind of reservation or nature preserve, a means for the ideological defense of psychology—to be more precise, for its survival as a science . . . the psyche—and in its wake psychology as well—found themselves inside the “circle of activity,” which was relatively safe from the ideological point of view, and it was this that enabled psychology to exist. (Zinchenko, 2004, p. 31)

In this connection, it is quite striking that in neither the work with children published as late as 1962 nor in the monograph about stabilized images published in 1969 is there any mention of Vygotsky. Even Zaporozhets, in his summary article published in 1969, only mentioned Vygotsky briefly, in connection with Leontiev and Galperin, all of whom had spent time together in Kharkhov where the focus on activity emerged. Given the centrality of Vygotsky in Vladimir Petrovich’s later writing, we can only attribute his absence as a central figure to the lingering ban on his works from 1934 to the publication of a small portion of his writings in 1956. Vladimir Petrovich had encountered the name of Vygotsky both at home and as a graduate student, but his work was still relatively inaccessible in published form, and it was still largely off limits when tracing one’s intellectual heritage in print.

Other factors were almost certainly involved. Within psychology, there was an ongoing struggle over how to interpret Vygotsky's legacy in which Leontiev and Vladimir Petrovich's father both adopted adversarial roles. Nationally, the Thaw was just beginning. Khrushchev gave his famous speech in 1956 denouncing Stalin, and Vladimir Petrovich published his first article that same year.

With this additional context, we can see Phase 1 as a time when work on a theory of liberated action was taking place behind, so to speak, layers of screens of different social languages (as Bakhtin uses that term). The first social language is that of the Soviet State in the period of late Stalinism and the subsequent thaw, which took time to trickle down in psychology. Here we encounter the use of Pavlovian language and references to the philosophical works of Marx and Lenin. The second social language arose in connection with the domain of social concern such as perceptual/cognitive skill training for young children that evokes its own social as well as disciplinary discourse focused on processes of developmental change. Further obscurity is achieved by conducting research working through the high end of technically sophisticated means for conducting research. All the specialization needed to follow the arguments in the articles in a subtle manner discouraged deeper analysis. Yet another screen was created by incorporating strategically useful phrases from "the classics" (political, philosophical) and using them as a shield against ideological attack, which could extend all the way to being physically dangerous at the time. Using such social languages as screens is precisely what Vygotsky had declared he would *not* do. But he had the good sense to die of tuberculosis before he had to face retraction or destruction. His heirs were faced with the difficult circumstances that Vygotsky saw coming.

Phase 2: Ergonomics—The study of cognition in complex man–machine systems

We are uncertain as to the circumstances that led to a shift of Vladimir Petrovich's work from children and stabilized images to adults, and from schoolrooms to complex work settings characterized by advanced, "information" technologies: the studies of operators manipulating joy sticks to control an image on a computer screen. Whatever the reasons for a shift, as we now see it, this work was a direct extension of the prior studies of children and fixed images. However, this new phase in Vladimir Petrovich's research program was located directly in the area of what

has come to be called the “military-industrial complex”—Soviet style. An article on perceptual action appeared in a book on engineering psychology in 1964, when the category of engineering psychology was just beginning to recover from its ideologically driven abandonment in the 1930s. At the end of the 1960s, ergonomics, the study of man–machine interactions, became an acceptable discipline; articles growing from Vladimir Petrovich’s research program, now conducted in close collaboration with his wife, Natalia Dmitrievna Gordeeva, began to appear in *Ergonomika* and the proceedings of the All-Union Scientific and Research Institute of Industrial Design. The experimental apparatus consisted of a system for controlling a cursor on a screen using a joystick. The subjects in the experiment had to learn to track visual objects on the screen that moved along *X* and *Y* axes (left–right, up–down), while changing in size (the third dimension associated with an away/toward motion). This sort of task is easily recognizable as something a cosmonaut, a train dispatcher, or a fighter pilot might be required to carry out with great speed and accuracy.

As Natalia Dmitrievna and Vladimir Petrovich summarized the situation:

The use of a computer in the experiment enables the operator to present on the screen trajectories of movement varying in complexity, number of elements, and number of components: he can induce “breakdowns” in the normal course of an action that require a change in the trajectory of movement; he can cause an inversion, i.e., break the normal relation between the perceptual and motor fields; and he can vary over a wide range the transmission ratio between the movement of the control unit and the spot on the screen, vary the rate of movement of the target along the screen, etc. The computer enables him to obtain continuous information on the ongoing characteristics of the time, the precision, and the speed of the subject’s movement. (Gordeeva and Zinchenko, 1997, pp. 59–60)

Although the data obtained from this line of inquiry was even more complex than anything attempted in earlier phases of Vladimir Petrovich’s research, there can be no doubt of a tight linkage between the theoretical aspirations involved.

An action is not rehearsed, but constructed. According to N.A. Bernshtein, exercise is a rehearsal without repetition.² In other words, in the construction of an action, one can always observe rivalry or competition between its conservative properties, determined by already-existing programs and mnemonic schemata, and its dynamic properties, determined by the novelty of the situation and of the goals and by the sense implicit in the motor task (*ibid.*, p. 51).

Once again, of course, we failed to discern the meaning of a great deal in passages such as this one before undertaking this essay. And the same set of conditions that misdirected us before is still very relevant: this appeared to us primarily as applied, engineering psychology.

Moreover, it appeared entirely assimilable into routine “boxology” of the sort that was and remains popular in American cognitive psychology. We were not the only ones to interpret this work as standard experimental, cognitive psychology. In a recent volume titled *Acting with Technology*, Victor Kaptelinin (himself once a student at Moscow University) and Bonnie Nardi wrote the following about this line of work:

The functional blocks, as described by Zinchenko, were almost identical to the “boxes” typical of information processing models of the late 1960’s, such as the model proposed by Atkinson and Shiffrin (1968). . . . The work by Zinchenko demonstrated activity theory and cognitive psychology are not incompatible and that, in principle, cognitive models can be integrated into activity-theory accounts. (Kaptelinin and Nardi, 2006, p. 184)

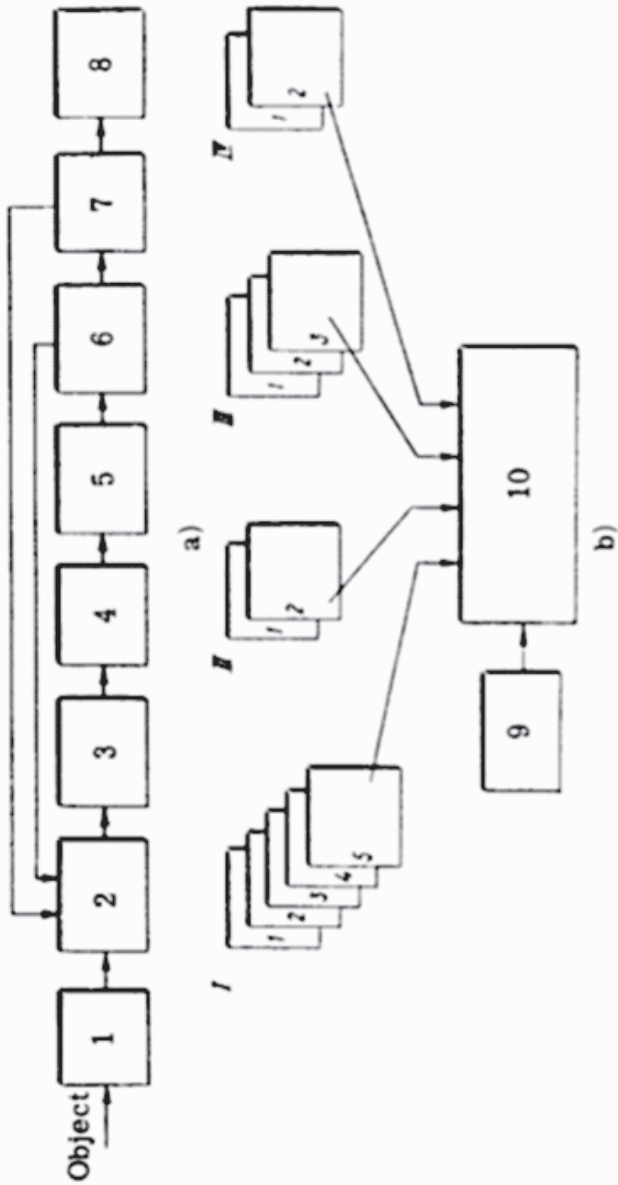
A rereading of this work in the present context indicates how Vladimir Petrovich made it appear that he was carrying out routine information-processing psychology while at the same time, for those who knew how to read it, pointing to ways in which he was pursuing a markedly distinct agenda. This contradiction can be seen by comparing a typical “boxological” diagram (Figure 1) of the process of forming an image of a situation and the decidedly nonboxological diagrams (Figure 2) that occurred in the same publications.

The spirit of the nonboxological representation of the psychological course of action is summarized by appealing to how Merleau-Ponty described the work of Matisse recorded on a slow-motion camera:

The brush, which if one looked at it with the *naked* eye simply jumped from one place to another, now that it became visible in slow motion behaved quite differently: it seemed to think for a time, made dozens of trial movements, danced before the canvas, sometimes barely touching it, and suddenly, precipitously, like a bolt of lightning, applied the one line needed. (quoted in Gordeeva and Zinchenko, 1997, p. 95)

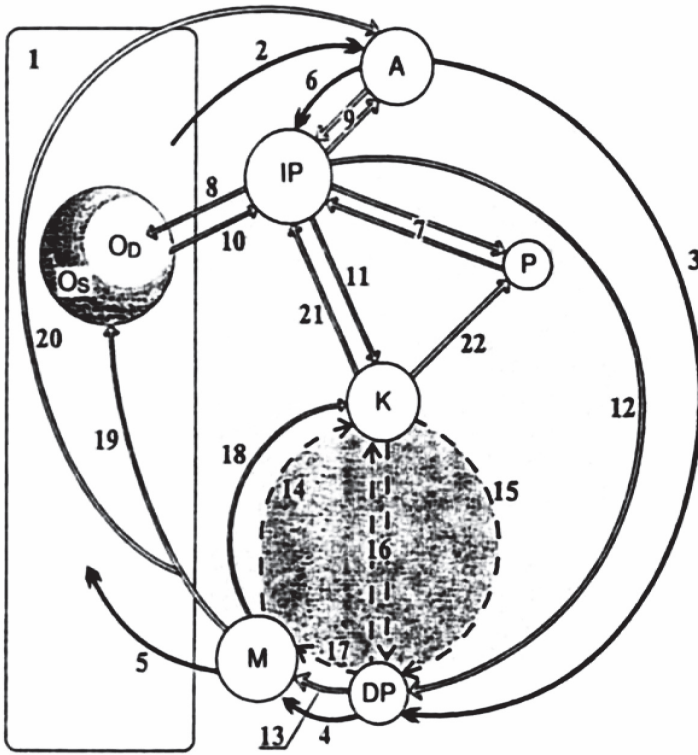
Of special interest is the comment that “This ‘thinking for a time,’ filled with dozens of fine movements, in a sense steers in space the one possible future action, filling it with a general purpose, which confirms our notions of the structure of a meaningful, conscious, object-related action” (ibid., p. 95).

Figure 1. The Process of Image Formation Schematized in Terms of Subprocesses and Their Relations as It Appeared in the Early Work of V.P. Zinchenko and Colleagues



Source: V.P. Zinchenko, G.G. Vucheichich, and V.M. Gordon, "Image Formation," in *Art and Scientific-Technical Progress* (Moscow: Iskustva, 1973), p. 452.

Figure 2. **Functional Structure of an Object-Related Action**



- | | |
|--|--|
| A—polymodal afferentator | 9—information relevant to the motor task |
| P—memory unit | 10—compiling of a program and a plan of action |
| O _o —image of action | 11—model of an action |
| O _s —image of situation | 12—details of program of action |
| IP—integral program, plan of action | 13—motor commands |
| M—motor component | 14—ongoing information about the movement |
| DP—differential program | 15—ongoing corrective signal |
| K—checking and correction | 16—final information about movement |
| 1—objective situation (motor task, motive) | 17—corrective motor commands |
| 2—orienting signal | 18—final information about movement |
| 3—ongoing and extra signals | 19—changes in the objective situation (information for the image of situation and the image of action) |
| 4—ongoing and extra commands | 20—changes in the objective situation (information for the polymodal afferentator) |
| 5—change in the objective situation | 21—final result |
| 6—information from the environment | 22—information in the memory units |
| 7—information from the memory unit | |
| 8—activation of an image | |

Source: N.D. Gordeeva and V.P. Zinchenko, "A Model of an Object-Related Action: Composition, Structure, and Function," *Journal of Russian and East European Psychology*, vol. 35, no. 4 (July–August 1997), pp. 49–100.

Phase 2: Summarized

This second phase of Vladimir Petrovich's professional work extended over more than two decades. In it he, Natalia Dmitrievna, and their graduate students conducted dozens if not hundreds of experiments that explored the dynamics of perceptual actions as part of various complex cognitive tasks. To satisfy the practical demands of their work—to increase the effectiveness of an increasingly computer-driven man-machine, they sliced and diced the microstructural dynamics of image formation from the opening moments to its product. In these conditions, the images studied are no longer discrete objects as in the prior research but complex action/situation images unfolding at different time scales. This set of experiments allowed them, in their words, to conclude that

A system of object-related operations unfolding in time leads to the formation of an integral and momentarily perceived spatial image of the object, that is, an action is a means for transforming time into space and space into time. In the latter case, the momentary spatial image, serving as the regulator of an action, expands into a temporal picture of the movements entailed. (Gordeeva and Zinchenko, 1997, p. 50)

We are back with Bernstein and the idea of living movement.

This is also a period when Vladimir Petrovich, along with his close friend and colleague, Vasili Vasilevich Davydov, collaborated on a number of papers on psychological development, which led Vladimir Petrovich naturally back to issues that his father's generation, now passing, had been struggling to understand in the fraught conditions of purges, famines, and war. The increasingly comprehensive scope of his thinking is evidenced in the quotation from Merleau-Ponty, above, about Matisse painting. This scope constantly brought him up against the strictures of the Soviet system and he was, in our opinion, a master at providing tiny glimpses of his disgust with the system in which he worked, even in the difficult times of "stagnation" of the early 1980s and Cold War bluster of the 1980s. It could be seen, for example, in the way that he and Vasili Vasilevich snuck references to St. Augustine into their 1982 article in the journal *Problems of Philosophy*, the ideological center of Soviet academia. Immediately following an exposition of Bernstein's ideas to which we have referred, they demonstrate the ancient, and officially proscribed, origins of his ideas about time and action:

For instance, Augustine had the following to say: "Expectation refers to the future, and memory to the past. On the other hand, the tension in

an act belongs to the present: through it the future is transformed into the past. Hence, an act may contain something that refers to what has not yet come to pass” (Davydov and Zinchenko, 1981, p. 30).

This same article contains pointed examples from Bulgakov, Rilke, and Norbert Wiener, each ideologically suspect, each pointing away from the idea that top-down command and control of human activity can fully control the fundamental human need to be creative, and to engage in what, at about the same time, he began to refer to as liberated action (Zinchenko, 1985).

Phases 3 and 4

To simplify our story in light of the constraints set by both acceptable page length and the limitations of our current knowledge, we will discuss phases three and four together. This sequence appears to map well onto Vladimir Petrovich’s recent description of his career in the following terms.

My own development as a psychologist can be seen as an inversion of the history of the Soviet psychology: first there was the Cultural-Historical Approach; later—the Psychological Theory of Activity. I started with the latter and am slowly approaching the former now. From my earlier research on sensory-motor skills and perceptual actions I had moved to studies of the development of visual image, visual thinking and visual memory; finally, through my fairly late interest in poetry and psychology of art, I have turned my attention to the Word and Culture—at last. (Zinchenko, 2008, p. 1)

In the terms we have been using thus far, Phase 3 is signaled by the entry of Vygotsky into Vladimir Petrovich’s published writing. For Vladimir Petrovich, this intellectual change coincided with both the changing intellectual climate (Vygotsky once again became ideologically acceptable after more than twenty years of erasure) and new institutional relationships (Vladimir Petrovich was excluded from the inner circle of power brokers in Soviet psychology, the same exclusion that made his involvement in ergonomics both possible and necessary). Vygotsky is not clearly visible in the mid-1970s when Vladimir Petrovich wrote about visual culture and creative action for a Soviet audience (Zinchenko, 1975). But Vygotsky was there front and center in Vladimir Petrovich’s 1985 essay on Vygotsky and units of analysis.

In this connection, it seems important to us to remember that Vladimir

Petrovich is one of a generation of psychologists whose fathers were key players in the original Vygotsky–Luria–Leontiev collaborations. Vygotsky’s central group of followers went on to form the Kharkov School of psychology, and, following Leontiev, became a part of the generation of activity theorists along with Sergei Rubenshtein. It seems essential to us to note that he did not jettison Leontiev when incorporating Vygotsky. Rather, in his own way, he sought to reconcile the division that had grown up in his parents’ lives in the 1930s and 1940s.

The cardinal event that marks the Phase 3–Phase 4 transition was the end of Soviet Power in 1991. It is important to recall that several years prior to the demise of the Soviet Union there was a period of radical reforms during which Soviet and American scholars were allowed to interact with each other more extensively. And to interact more extensively, when there is vodka in the room, means to communicate more freely. At this point, we see a transition that is signaled by Vladimir Petrovich’s use of capital letters when writing about the Word and Culture. The transition from word to Word and culture to Culture coincides with the entry of the term “spirituality” into Vladimir Petrovich’s writing. He defines spirituality as “the immaterial aspects of reality” (Zinchenko, 2002, p. 17). As he writes about it now, Activity Theory has become too heavy for him, too focused on production of material goods to think about the ideal, the imagined, the freer production of meaning. Activity theory remains valuable in some circumstances (we do want astronauts to return safely from the moon and our local warriors to come home uninjured from the war). But it does not speak to the quality of life or to that “investment of meaning” that lies at the heart of spirituality.

We obviously cannot hope to compress all of this more recent, very diverse work into a coherent discussion. Consequently, in the remaining pages we recount two directions our own ideas have taken us in our own attempts to deal with the same issues that have been preoccupying Vladimir Petrovich. We believe there is a great deal in common in our thinking, although we are aware that we write in a kind of “polyglossic” language—Vygotsky and Russian Culture mixed with American pragmatism and its preoccupation with cultures. Each set of ideas focuses, in its own way, on the concept of mediation, central to our thinking, as well as to Vladimir Petrovich’s.

The first example takes up a different aspect of the lessons about images and mediation one can learn from experiments involving fixed images, based on the stabilized image methods worked out by Vladimir

Petrovich and Vergilis (Zinchenko and Vergilis, 1972). The second focuses on narrative as a form of mediation. Both are relevant to his central concern with the “nonmaterial aspects of reality” as a realm of human freedom.

Stabilized images: Focusing on the fragmentation process

We have already encountered Vladimir Petrovich’s use of stabilized image methods to understand perceptual action. His research revealed that even when no motion of the eye can influence the spatial relation of the eye of the object before it, the eye continues to move, as if the mind’s eye were continuing to examine different parts of the object’s replacement, an image. Even under conditions of maximal constraint, this phenomenon indicates the possibility not only of freedom from the world, but freedom within it.

American research on stabilized images being conducted at about the same time focused not on the perceptual actions that occurred during stabilization, but the fragmentation of the image during the process of stabilization or following a period of total stabilization as freedom of eye movement is regained.

Recall that in a stabilized image experiment, visual images are projected and stabilized on the retina using a special apparatus designed to move in perfect coordination with the retina. When a perfect alignment between saccadic eye movements and the projected image is achieved, the visual field goes gray. It fades into gray slowly and as it does so, the images break up before they disappear. If there is then a slight slippage in the apparatus, such that eye movements break free of their coordination with the projected image, fragments of the image reappear. The full image, however, reappears only when there is a free play of light from the world across the retina.

The physiological mechanism that explains the phenomenon of total fading of the image is unproblematic: the cells of the retina respond to changes and differences in luminance. These cells lose responsivity (“bleach out”) when luminance is invariant (e.g., when there is perfect coordination) (Inhoff and Topolski 1994; Pritchard 1971). Other research has shown that all the effective information is obtained during the moments when the eye is fixed on its target; no useful visual information is obtained during the saccadic eye movements (Matin, Matin, and Pearce, 1970). In addition, the passage of time between the fixations ensures

that when we fixate on an object we necessarily see it from a different angle, and on a different physical and physiological background than in the moment previous to that fixation. It seems that the flow of information from the world is discontinuous, and necessarily so. Yet, despite the presence of objective physical discontinuity, we experience the world as continuous. How is this possible?

In seeking to understand this process, American researchers directed our attention to the finding that the manner in which image fragments disappear or appear is not entirely random; it is not the case that arbitrary bits of the image fade, as though a lense were losing focus. Instead the ways in which an image fragments or reappears depend on the kind of stimulus presented to the retina in the experiment. Two classes of image-stimuli are important to the following discussion. The first are those heavily constrained by human phylogeny (e.g., the detection and recognition of faces); the second class of image-stimuli arise from accumulated constraints embodied in culture (e.g., the graphic letters in an alphabet).

The difference between these two kinds of stimuli is illustrated by the images in Figure 3 (Pritchard, 1971). In each row of the figure, the left-most image is the one stabilized with respect to the retina, while the images to the right are the images that subjects report seeing as the initial image disappears or reappears.

Essential to interpreting the figure is the fact that the “HB” monogram and the female profile share basic, biologically constrained properties such as the sharp changes of luminance at the borders between black and white. Differential responsivity at points of high luminance variations is present at birth (Bronson, 1990). Newborns fixate upon the hairline or other lines that provide high contrast with their background. In Vygotskian terms, we interpreted that the fragments into which the woman’s profile breaks up are predominantly natural, phylogenetic objects. What appears to be innate recognition of the mother’s face turns out to be recognition of a pattern of luminance. The one specifically cultural element in the fragments (the hair band) is secondary.

Precisely the opposite is true of the HB monogram which is a quintessential cultural object, the meaning of which depends upon knowledge of an alphabet. Differential luminance is of course present, but in every case the way the constituents of the HB monogram disintegrate and reappear are all reported as written alphanumeric symbols, not points of highest luminance contrast (see the bottom line of Figure 3). This response pattern

Figure 3. The Shapes into Which the Profile of a Female Head and the Monogram HB Disintegrate When They Are Fixed with Respect to the Movement of the Retina



Source: Adapted from R.M. Pritchard, “Stabilized Images on the Retina,” *Scientific American*, vol. 204 (1971), pp. 72–78.

cannot be attributed to phylogenetic history. Rather, each of the fragments is organized as a meaningful cultural unit (to literate persons).

To explain the fragmentation patterns of the HB monogram, Pritchard, following Hebb (1949), suggested that, as a result of the massive experience of using graphic symbols, the human brain has formed “cell assemblies,” what currently might be termed “cortical firmware,” to facilitate the maintenance and activation of their internal organization.

Following this interpretation of research on the components of the visual image, we can conclude that one component is highly specified by factors arising from the phylogenetic development of human beings. A second component conforms to individuals’ culturally organized experience. However, the two sources (or conditions) of experience are not sufficient to give a coherent image of the object before one’s eyes. A third component is required—the active reconciliation by human beings who must make sense of different sources of experience in real time (Pelaprat and Cole, 2012, in press). This active reconciliation of information arising at two slightly different points in time is made necessary by the operation of saccadic eye movements. This “resolving activity” is necessary for a whole image of the world to arise, and for thought and action to be possible. Therefore, what is referred to as an image is constituted of three parts: (1) a set of biological constraints stemming from human phylogenetic development; (2) a set of cultural constraints and its historical-social development; and (3) the individual resolution of the discrepancy between these two sources of constraint that, moment to moment, produces an image.

The third constituent is what Vladimir Petrovich was focused on in his earlier work. His boxological functional blocks appear to dissect that process for producing an image into seemingly discrete, measurable parts

that, taken as a whole, constitute perceptual actions. However, as Vladimir Petrovich knew full well, no matter how many boxes one divides the flow of living movement into, there will always be a residual element, a process “between the boxes,” represented only by a slim, black line in depictions of the model, where the outcome is not predetermined. Here is the domain of imagination, the always-present “spiritual” side of human cognition.

We can leave this topic with greater appreciation for three issues. First, a process of image making, literally, into image making in Russian (*voobrazhenie*), occurs even when the object of our imagination is present to our senses; imagination is not (only) thought about something absent. Second, and related to this, it seems necessary for human cognition that individuals constantly engage in a process of image formation. Image formation is the “connecting bridge” between two states of experience: one given by phylogenetic history of the human species, the other given by the cultural-historical environment and prior individual experience. What this bridging process entails—and what the results of the fixed image experiment indicate—is that human beings are by nature always engaged in a process of image formation situated between nature and culture. Third, the existence of culturally mediated, historically sedimented constraints provides an additional layer of “the given” to human beings’ toolkit for dealing with the new. It provides more degrees of freedom with which to deal with the ongoing process of life. Culture and freedom are very deeply rooted in human psychology.

Bakhtin, Shpet, and mediated action

Another major domain of Vladimir Petrovich’s developing ideas about the cultural mediation of human mental life draws heavily on the work of Mikhail Mikhailovich Bakhtin and Gustav Gustavovich Shpet. This work illustrates how he incorporated many of Vygotsky’s ideas into his thinking, and how at certain points he goes beyond Vygotsky to place heavier emphasis on the cultural/spiritual side of the razor’s edge, the urge toward new, imagined, futures. Important in this regard are Vladimir Petrovich’s invocation of the “inner form of the word” as outlined by Shpet—one of Vygotsky’s teachers who had developed his own account of inner speech (Zinchenko and Wertsch, 2009)—as well as Bakhtin’s use of the utterance as a basic unit of analysis. At first glance, these ideas seem far removed from ergonomics or the psychophysiology of perceptual action. For example, in “The Problem of the Text in Linguistics,

Philology, and the Human Sciences: An Experiment in Philosophical Analysis,” Bakhtin (1986) examined the utterance or text as his basic unit of analysis in human communication and outlined an approach that recognizes the inherently unique dimension of language use:

[B]ehind each text stands a language system. Everything in the text that is repeated and reproduced, everything repeatable and reproducible, everything that can be given outside a given text (the given) conforms to this language system. But at the same time each text (as an utterance) is individual, unique, and unrepeatable, and herein lies its entire significance (its plan, the purpose for which it was created). This is the aspect of it that pertains to honesty, truth, goodness, beauty, history. (ibid., p. 106)

Bakhtin’s claims about these “two poles of the text” (1986, p. 105) echo Bernshtein’s idea of “repetition without repetition” and Bakhtin’s own formulation of “repeatable and unrepeatable moments of the utterance.”

Using this more culturalist emphasis, Vladimir Petrovich managed to create a host of insights into free action and functional organs, those concepts of long ago. Of particular interest in this connection is how he characterizes functional organs in terms of their “biodynamic sensuous affective ‘tissue’” (Zinchenko, 2002, p. 8), an observation that points to a more dynamic, organically oriented picture of psychological functioning in contrast to a mechanistic or deterministic one often favored in “boxology.”

These ideas come across especially clearly in Vladimir Petrovich’s account of *mediation*, which “constitutes the very core of cultural-historical psychology” (Zinchenko, 2002, p. 9). He credits Vygotsky, whose intellectual heritage comes through clearly on this issue. In certain respects the notion of mediation played a more central and telling role in Vygotsky’s writings than it does for Vladimir Petrovich, while at the same time, there are certain ways in which Vladimir Petrovich goes beyond what Vygotsky had to offer on this topic.

For example, Vygotsky focused on the emergence of mediation in history and ontogenesis as a crucial factor that separates humans from other species, and higher from elementary mental functioning. It is for this reason that he emphasized the qualitative transformation involved with the incorporation of tools and signs into human action:

By being included in the process of behavior, the psychological tool [i.e., sign] alters the entire flow and structure of mental functions. It does this by determining the structure of a new instrumental act just as a technical tool alters the process of a natural adaptation by determining the form of labor operations. (Vygotsky, 1930/1981, p. 137)

In contrast, Vladimir Petrovich questions the assumption of a “natural” line of development for elementary mental functions that exists independently of language and can hence be transformed by the encounter with speech. Drawing on recent studies of infant development, he argues that even at the earliest stages of life “the infant is far from being indifferent to the language atmosphere that surrounds it” (Zinchenko, 2008, p. 6). His ideas concerning the always-cultural nature of the human environment come not only from current research on infant development but from sources as diverse as the Russian Orthodox theologians: Pavel Florensky concerning culture and Nikolai Berdyaev concerning creativity and freedom. Most important, they are grounded in an integrative view of human mental life suggested by the notion of a functional organ, originating in the work of A.A. Ukhtomsky, a prominent physiologist in the 1920s. Instead of positing a dialectic of strictly opposing forces, Vladimir Petrovich sees a “certain similarity in architectonics of the word, action and image” (*ibid.*, p. 4). According to this view, in line with the emphasis on spirituality, Vladimir Petrovich insisted that diversity, quasi-organized social life, not a monolithic, fundamentalist vision, is what a consciousness, oriented to the future, should treasure.

Concluding comments

We hope that our story has proved useful to readers in thinking more deeply about the lessons to be learned from Vladimir Zinchenko’s life work. We can testify personally that we, at least, have been the beneficiaries of our rereading of Vladimir Petrovich’s amazing reach as a humanist scholar.

In short, we believe our story goes like this: The freedom allowed by perestroika and then the disintegration of the Soviet Union, coupled with many years of experience, including the research we have briefly described above, brought Vladimir Petrovich to a richer understanding of the implication of cultural mediation in human life. In his late work he makes it clear that top-down, received wisdom from the state about human progress cannot prevail in the long run, although it can crush people for lifetimes. However bitter the circumstances, as long as there is a gap between power and the individual, culture serves as the arena of human freedom and a tool for collective action. “Culture is alive as long as it can question itself; otherwise it becomes stagnant and dies” (Zinchenko, *in press*, p. 1).

But culture is not indestructible. It was built by human beings and it

has been torn down by human beings. What is required, if we have interpreted Vladimir Petrovich's current thinking correctly (to use American terminology), is the maintenance of cultural diversity as a condition of avoiding fossilized notions of a virtuous future.

In closing we wish to join Vladimir Petrovich in urging upon scholars the necessity of dialogue as a condition of self-examination, of reflexivity. We fully agree that this injunction "applies to Cultural-Historical psychology as well" (*ibid.*). This essay is such an exercise—a self-examination of our limited understandings of the fundamental ideas of Russian psychology through the medium of Vladimir Petrovich. We have, as Barthes urged upon us, reread. We hope we have produced a story that can be reimagined by future generations of psychologists.

Notes

1. It is currently understood that the German (*Tätigkeit*) and Russian (*deiatel'nost'*) words translated as "activity" in English do not correspond. This is but one of the many examples of the problem of interpreting Russian psychological research for Anglophones to which we referred at the outset of this article.

2. Here we introduce our own repetition without repetition. This encounter with Bernshtein's idea about the impossibility of exact replication illustrates precisely the principles involved!!

References

- Bakhtin, M.M. 1986. "The Problem of Text in Linguistics, Philology, and the Human Sciences: An Experiment in Philosophical Analysis." In *Speech Genres and Other Late Essays*, pp. 103–31. Austin: University of Texas Press.
- Barthes, R. 1974. *S/Z*. New York: Hill and Wang.
- Bronson, Gordon W. 1990. "Changes in Infants' Visual Scanning Across the 2- to 14-Week Period." *Journal of Experimental Child Psychology*, vol. 49, no. 1, pp. 101–25.
- Davydov, V.V., and V.P. Zinchenko. 1981. "The Principle of Development." *Soviet Psychology*, vol. 20, no. 1, pp. 22–46.
- Gordeeva, N.D., and V.P. Zinchenko. 1997. "A Model of an Object-Related Action: Composition, Structure, and Function." *Journal of Russian and East European Psychology*, vol. 35, no. 4 (July–August), pp. 49–100.
- Hebb, Donald O. 1949. *The Organization of Behavior: A Neuropsychological Theory*. New York: Wiley.
- Inhoff A.W., and R. Topolski. 1994. "Use of Phonological Codes During Eye Fixations and in On-Line and Delayed Naming Tasks." *Journal of Memory and Language*, vol. 33, no. 5, pp. 689–713.
- Kaptelinin, V., and B. Nardi. 2006. *Acting with Technology: Activity Theory and Interaction Design*. Cambridge: MIT Press.

- Luria, A.R., and O.S. Vinogradova. 1959. "An Objective Investigation of the Dynamics of Semantic Systems." *British Journal of Psychology*, vol. 50, pp. 89–105.
- Matin, L.; E. Matin; and D.G. Pearce. 1970. "Eye Movements in the Dark During the Attempt to Maintain a Prior Fixation Position." *Vision Research*, vol. 10, no. 9, pp. 837–57.
- Peleprat, E., and M. Cole. 2012. "Minding the Gap: Imagination, Creativity, and Human Cognition." *Integrative Psychological and Behavioral Sciences* (in press).
- Pritchard, R.M. 1971. "Stabilized Images on the Retina." *Scientific American*, vol. 204, pp. 72–78.
- Vygotsky, L. 1981. "The Instrumental Method in Psychology." In *The Concept of Activity in Soviet Psychology*, ed. James Wertsch, pp. 134–43. Armonk, NY: M.E. Sharpe.
- Zaporozhets, A.V. 1969. "Some of the Psychological Problems of Sensory Training in Early Childhood and the Preschool Period." In *A Handbook of Contemporary Soviet Psychology*, ed. M. Cole and I. Maltzman, pp. 86–120. New York: Basic Books.
- Zinchenko, V.P. 1975. "Problems of Visual Culture in the Light of Modern Investigations of Visual Perception and Visual Thinking." *Russian Social Science Review*, vol. 16, no. 2, pp. 47–58.
- . 1985. "Vygotsky's Uses of History." In *Culture, Communication, and Cognition: Vygotskian Perspectives*, ed. J. Wertsch, pp. 119–45. New York: Cambridge University Press.
- . 2002. "From Classical to Organic Psychology: In Commemoration of the Centennial of Lev Vygotsky's Birth." In *Voices Within Vygotsky's Non-Classical Psychology: Past, Present, Future*, ed. D. Robbins and A. Stetsenko, pp. 3–26. New York: Nova Science.
- . 2004. "The Psychological Theory of Activity: Rememberances of the Future." *Journal of Russian and East European Psychology*, vol. 42, no. 2 (March–April), pp. 30–68.
- . 2008. "Early Stages in Children's Cultural Development." Paper presented at the Congress of the International Society of Culture and Activity Research, San Diego, September.
- Zinchenko, V.P., and N.Iu. Vergilis. 1969. *Formirovanie zritel'engo obraza*. Moscow: MGU.
- Zinchenko, V.P., and J.V. Wertsch. 2009. "Shpet's Influence on Psychology." In *Gustav Shpet's Contribution to Philosophy and Cultural Theory*, ed. G. Tihanov, pp. 45–55. West Lafayette, IN: Purdue University Press.

Copyright of Journal of Russian & East European Psychology is the property of M.E. Sharpe Inc. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.