Soviet Psychology and Psychophysiology

How successful are the two sciences in the Soviet Union? Are the Russians able to synthesize them?

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In the summer of 1934, I visited the Soviet Union, and among other things, I tried to interview Pavlov. I had just received my doctor's degree; I had no appointment with Pavlov, but he consented to talk to me in his laboratory. The first question he asked was: "Are you a physiologist?" Sensing trouble, I said: "Unfortunately, I am only a psychologist." He smiled and said: "Are you at least a behaviorist?" I said: "I was" (at that time I could say it more readily than now), and this saved, in part, the situation. Pavlov talked to me for about three hours, discussing his ape experiments, criticizing Gestalt psychology and praising British associationism and the work of Thorndike, Loeb, and Jennings. I could not put in a word or question edgewise; he never asked me where I learned Russian or whether I was of Russian descent, but in the course of talking he remembered a review on conditioning I had written and remarked that we Russians must show the world that we can do more than make revolutions. His close collaborator and "aide-de-camp," M. K. Petrova, came in twice, ostensibly worried about the length of the interview (Pavlov was 85 at the time), and I, too, though obviously pleased, became concerned after a while. Pavlov, however, did not seem to heed our "conditioned" reactions, continuing his exposition with unusual and youthful vigor and lapsing, at one time, into a recital of a long passage from *Faust* to illustrate how the laws of conditioning operate in verbal associations. He promised to have his office send me a prepublished report of his ape experiments and several other publications, which, for some reason, I never received. Pavlov died a year and a half later.

I am telling this story not merely for reasons of rhetoric but as a substantive preface to a consideration of the special state of psychology in Soviet Russia and to my contention that no meaningful tracing and evaluation of Soviet psychology in terms of American psychology is possible without including Pavlovian physiology, which we may call psychophysiology but which Pavlov called, for years, "higher nervous activity." Let me illustrate. Suppose you take our two psychological journals of basic research, the *Journal of Experimental Psychology* and the *Journal of Comparative and Physiological Psychology,* and ask who in Russia would do this kind of research; the answer would be that in three out of four cases—surely in two out of three and possibly in four out of five—such research in Russia would be done by psychophysiologists (more correctly, "higher nervous activitists," but that is a clumsy term). If you take the *Journal of Abnormal and Social Psychology,* you will first find that a large portion of the work reported would not have been done in Russia at all, but then will discover that in this case too, Soviet psychologists trail their psychophysiologists and psychiatrists in whatever is done in the area. Even the kind of material published in the *Journal of Applied Psychology* and the *Journal of Educational Psychology*—again, whatever is done in the area—would as frequently come from a physiological as from a psychological laboratory. Likewise, whatever we have in our two evaluative journals, the *Psychological Bulletin* and the *Psychological Review,* would in Russia fall mostly within the bailiwick of physiology or psychophysiology or higher nervous activity.

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General Orientation

A few months ago Smirnov stated (*1*), with some pride, that the Soviets have now no less than 700 professional psychologists (the 1958 *Directory of American Psychologists* lists 16,644). I have not seen an estimate of the number of their psychophysiologists, but my files contain the names of about 60 publishing Soviet psychologists and about 500 publishing Soviet psychophysiologists. I recently checked the *Large Soviet Encyclopedia*—the 39-volume recent edition—for sketches of contemporary Soviet psychologists and psychophysiologists. I found sketches of 13 physiologists but of only one psychologist. At the recent convention of Soviet psychologists (*2*), the two longest and, by all tokens, most important papers, as well as a number of other papers, were by physiologists. Soviet psychological publications are published by the Academy of Pedagogical Sciences; psychophysiological publications are published by the General Academy of Sciences, which is a very restricted body—more restricted than our National Academy of Sciences—and the true Olympus of basic Soviet science. More than that, the only journal in the natural sciences that the General Academy publishes in German as well as in Russian is the psychophysiological *Journal of Higher Nervous Activity.* There are, in the Soviet Union, scores of research institutes in psychophysiology but there are only about half a dozen in psychology.

I think I have said enough to indicate that, vis-à-vis psychophysiology, psychology is a rather small enterprise as a basic science in the Soviet Union. I do not even know whether I should call it a junior partner or a younger brother; perhaps an "unsteady sputnik" might be more appropriate, or really a commensal organism, one that partakes of the food of another organism without being parasitic. And, finally, with respect to training, a Soviet physiologist is an American physiologist *plus*—that is, he has the training of an American physiologist plus special training in psychophysiology. A Soviet psychologist is an American psychologist *minus*—that is, he has a narrower spectrum; he is likely to know less physiology, be less familiar with brass instruments, and in general be less of a scientist. Of course he may say he knows dialectical materials. But what is that? Even if one grants that it is a tenable philosophy, its heuristic value to an independent hard-core psychology is, to

use a Russian expression, that of "*toloch vodu*" (grinding water); at best it is merely declaratory and programmatic.

Yet within its own orbit, Soviet psychology as such is not without influence. Psychologists seem to dominate the Academy of Pedagogical Sciences and, together with the "methodists" (specialists in methods of teaching), seem to set the pattern of "how to do it" in Soviet education. Psychology was until very recently taught as a high-school subject in the Soviet Union, and, as a result, each year several million copies of elementary psychology textbooks were mastered by Soviet youngsters and reached Soviet homes; this, of course, is more than we do here. And psychologists participate, to some extent, in the work of mental institutions—though such participation is mostly confined to work with the handicapped (so-called "defectology") as distinguished from psychopathology (in Russian, usually "pathopsychology")—and are now beginning to plan to participate in Soviet industrial and agricultural adjustments. Again, while a good many of their publications are still more largely concerned with "what is to be done," and with "trying to do" rather than with "doing," I suppose their very "tryings" and "ways of tryings" are in themselves of special interest, particularly since there is no question of discontinuing psychology, as such, in the Soviet Union. The prevalent ideology is surely that, right or wrong, there must be a psychology on top of a psychophysiology, and about the worst accusation you can make against a Soviet psychophysiologist is to say that he wants to liquidate Soviet psychology (*liquidate* is an uncomfortable word). So, we have two disciplines to consider; let us begin with psychophysiology.

Psychophysiology: In Pavlov's Footsteps

The first significant point about Soviet psychophysiology that needs to be made is the fact that, unlike Soviet psychology, it has in itself, in the course of 40 years, been very little, if at all, interfered with by the Soviet state or Soviet philosophy. At no time was experimentation in Pavlovian conditioning and related phenomena in any way curtailed, and at no time was any Pavlovian doctrine per se —let us say, stimulus generalization or higher order conditioning—criticized as being in conflict with dialectical materialism. (Of course, it might well have been!) All that was said, at certain times (in fact, most of the time), was that Pavlovian psychophysiology does not exhaust psychology or, in Soviet lingo, that "it studies the material basis of the mind, but not the mind itself"—which was no doubt fine with the vast majority of the rank-and-file experimentalists, tired of extrapolating and stretching their research findings. It must be remembered that Soviet psychophysiologists, unlike American psychologists or even American bevahiorists, are under no compulsion to explain mental phenomena—most of them seem to be well satisfied with the significance of their results at their own level (just as our own physiologists would be). Hence, the curve of production of Soviet psychophysiological research has been steady and continuous and, as a rule, positively accelerated—now very much so—from the very beginning of the Soviet era till the present day (*3*). I cannot detect in this curve any influence of the "new economic policy" or the "popular front" or the "Hitler pact" or of Stalin's changing and deteriorating personal predilections. The fact is that the philosophical basis of Soviet psychophysiology per se was questioned even less than that of Soviet physics—let us say, the physics of Mandelstamm and Kapitza. And no Soviet scientist was, by Soviet standards, more tolerated or more coddled than Pavlov, whose views were at times openly anti-Communist (*4*).

True, beginning with 1950 Pavlovian psychophysiology has, in a sense, fallen under state control (*5*). But these controls aimed to preserve its purity and extend its applicability and by no means to question its validity or interfere with its empirical continuity. Besides, these controls have in the last three or four years been mostly removed. Hence, by and large, the development of Pavlovianism per se has really been quite autochthonous and probably would not have been very different if Pavlov had lived in a free country (*6*). Indeed, an argument can be made to the effect that to some extent—or to a large extent—Soviet psychophysiology has in the last 30 years developed more normally, more evenly, and more efficiently than its familiar homolog or counterpart, American behaviorism. Let me explain what I mean in eight short summary statements, which will, I hope, also serve as short sketches of the present status and achievement of the Soviet psychophysiology and which will keep American behaviorism as a yardstick or frame of reference.

1) Soviet psychophysiology has continued to be strongly empiricistic and fact-collecting. The conceptualization and mathematicalization that has gripped a good portion of American behaviorism in the last two decades or so has not touched it. Lacking, in general, the benefit of our philosophy of science, it may also, perhaps, have benefitted from the lack of it. Soviet psychophysiologists seem to be little worried about having too many meaningless facts and not enough meaningful theoretical frames to pin the facts to and, as a result, have accumulated a staggering amount of experimental material (my bibliography of their experiments has now reached the 4000 mark). The extent to which the Russians go to get facts on conditioning, for instance, is surprising. There are four experiments in which dogs were conditioned, put to death, then revived after 3 to 15 minutes and retested for conditioning changes [(*7*), the Soviet Academy of Medical Sciences has for some years maintained in Moscow a special "resuscitation" laboratory]. There are experiments in which dogs were conditioned dressed in jackets loaded with heavy weights (*8*). There are experiments on the relation of conditioning to dozens of diseases, scores of drugs, wide varieties of diets, and all kinds of tissue ablations (*9*), as well as to such special variables as sexual excitation (*10*), castration (*11*), ligation and cutting of spermatic cords (*12*), pregnancy (*13*), ligation of veins and arteries (*14*), ovarian implantation (*15*), operative rejuvenation (*16*), antibiotics (*17*), and radial acceleration (*18*). Indeed, the standard Soviet way of trying out a drug is to see its effect on conditioning; their equivalents of our studies of the psychological effects of, let us say, polio or lead poisoning would be studies of the effects of polio (*19*) or lead poisoning (*20*) on higher nervous activity—that is, conditioning. On the other hand, the Russians do not have—or, shall I say, do not waste experiments on "settling"—subtle problems of theoretical controversy: need reduction, nature of discrimination, cognition, and so on. In this respect they are really much like B. F. Skinner and American functionalists. But here is the second statement.

2) Unlike Skinner and a number of

other behavioral positivists, however, the Russians have never given up investigating the neurology of learning. Their studies in brain extirpation, their searchings for anatomical and physiological loci and foci of learning and, in more recent years, for electroencephalographic —brain-wave—correlates of learning, are surely impressive in number. I would estimate that Russian experimentation in the last-named area may well exceed American and English efforts combined; just a single issue of a recent Russian journal (*21*) reports 11 substantial studies on electroencephalographic correlates of conditioning—six with rabbits and five with human subjects. And it seems that this is the first area of Russian experimentation to begin to attract the attention of Americans. In the 1957 *Annual Review of Physiology,* Liberson reviews 140 Russian titles in a chapter entitled "Recent advances in Russian neurophysiology" (devoted mostly to the neurology of learning), and in a prepublication chapter for the forthcoming *Handbook of Neurophysiology*—a chapter entitled "The neural basis of learning," by Robert Galambos and Clifford Morgan—there are extensive quotations from more than twenty abstracts of Russian references. Moreover, both Liberson, and Galambos and Morgan, are complimentary in their appraisal of the Russian work. Liberson states, for instance, "In the field of electrographic correlates of conditioning, Russian neurophysiologists have been doing pioneering work," and, "It is in the field of comparative physiology of higher nervous functions that the most intriguing work has been turned out in Russia during recent years," while Galambos and Morgan say, "The use of microelectrodes in EEG is just beginning in non-Russian hands."

Galambos and Morgan do not, I assume from their references, read Russian and have had access only to some non-Russian abstracts, while Liberson, who reads Russian, complains that a good deal of the literature was not available to him. An All-Union Conference on Electrophysiology, at which 70 papers were read, was held in Leningrad 8–11 May 1957 (*22*). From the conference's abstracts as well as from the work on morphological neural changes during conditioning reported by the laboratories of Beritov (*23*) and of Sarkisov (*24*), I judge that the Russians feel that they are on the verge of real breakthroughs in the neurology of learning and that they are actually in the process of converting Pavlov's "conceptual nervous system" into a real one. And I notice that the French electrophysiologist Gastaut seems to share this view. He and his colleagues Rogers, Dongier, Naquet, and Regis (*25*) have been working hard on providing, in their own way, true neural underpinnings to Pavlov's brain theories, and they seem to feel that at least in part they have succeeded. The long-existing gap between Pavlovian and classical neurology may thus, it may be hoped, be bridged. I of course do not mean to minimize our own breakthroughs in the area, such as those of Olds (*26*) and of Delgado, Roberts, and Miller (*27*). But the Russians have been at it all the time, while we are, to a large extent, Johnny-come-lately's. Our *positivism* may well have served us negatively.

3) My third statement pertains to psychopathology and psychopharmacology. Pavlov began applying his teachings to problems of psychopathology as early as 1918, while his interest in relating pharmacology to conditioning started around 1908 (Pavlov was a professor of pharmacology before he was one of physiology). And this initial work in experimental neurosis, special typology, functional pathological neural states (paradoxical and ultraparadoxical), and differential conditioning effects of bromides and caffein has since multiplied, manifoldly and multifariously, and has added new empirical findings and concepts of verbal conditioning, interoceptive conditioning, sleep therapy, hynotherapy, drug therapy, and the like, so that by now the Russians have quite a complete and complex system with respect to the etiology, understanding, and treatment of mental disorder. The clinical claims of Soviet psychopathology are difficult to evaluate, though the Russians' discharge rates from mental hospitals do not seem to be lower than ours, but their experiments, particularly the psychopharmacological ones, are too objective and too numerous (about 500 experiments) for us to ignore. One series of experiments, combining studies of the pharmacology and the neurology of learning, by Anokhin (*28*), probably the most brilliant of all Soviet psychophysiologists, seems worth citing specifically. Three pairs of electrodes were implanted in the cortex, thalamus, and reticular system of rabbits, and the animals were conditioned to refuse food (carrots) in a hutch in which they had previously received electric shocks. The neurological effects of the conditioning were clear-cut electroencephalographic desynchronizations when the animals were placed in this hutch. But when the drug aminazine was administered, the conditioning was "washed out": electroencephalographic synchronization was restored, and the animals accepted avidly the proffered food in the hutch to which they were negatively conditioned.

4) Soviet psychophysiology has also made, in recent years, notable—indeed striking—contributions to our knowledge of verbal conditioning—that is, conditioning reflexes to verbal stimuli (not verbal reinforcement). I have done a little work in this area myself, but in general this sort of experimentation has been very scanty in this country, and until very recently the Russians, too, have not done much. However, after Stalin's 1950 pronunciamentos on linguistics, they dug up Pavlov's view on the second signal system, combined the two in some way, and started a mad rush, so that today verbal conditioning is probably their most intensively investigated single area—an area in which, incidentally, the psychologists have joined the psychophysiologists. Let me cite three recent experiments as samples. Markosyan, a psychophysiologist reporting at a psychological conference (*29*, p. 152), conditioned blood coagulation, through electric shock, to the sound of a metronome and the flash of an electric lamp and found that this conditioning transferred to the words *metronome* and *lamp* as well as to semantically and phonetically related words. Elkin (*29*, p. 370) conditioned the eyelid reflex of 25 school children to the sentences "it is a sunny day today" and "it is raining today" and found that the conditioning was very easy when the sentences corresponded to the prevailing weather but very difficult or impossible, when the weather during the conditioning or testing, or both, was different from that described in the sentences. Volkova (*30*) discovered that the food-salivary reflexes of school children who had been conditioned positively to the word *right* and negatively to the word *wrong* carried over correctly to right and wrong sentences: for example, to "8 divided by 2 is 4" versus "10 divided by 2 is 3," and to "Snow melts in spring" versus "It is always cold in the South." I don't think the Russians have discovered a way of conditioning to truth! But obviously the experiments are of basic significance to

both the theory and practice of human behavioral control.

5) One of the chief differences between Soviet and American conditioning studies is that we concentrate on one kind of reaction while they go in for variety. And of this variety of reactions, the most important one, and the one that we have never even touched, is that of interoceptive, or viscerovisceral and viscerosomatic, conditioning. You condition the uterus to respond when the ureter or urinary bladder is stimulated and vice versa, or you condition the pancreas to secrete when the gall bladder is stimulated or vice versa, or you simply teach the animal to withdraw its paw or lift its paw when the visceral changes occur (*31*). Most of these experiments are done through surgical exteriorization of the viscera, and their ramified theoretical and clinical significance could hardly be overestimated. In fact, they are even important in animal space travel, inasmuch as Soviet animals could presumably be trained by means of conditioned interoception to signalize not only stimuli around them but also reactions within themselves. Bykov's book, which has just been translated into English by Gantt (*32*), contains some of these experiments; but the book was originally written in 1942, whereas 85 percent of these interoceptive experiments have been performed since (my bibliography of interoceptive conditioning has now reached the 200 mark). And here I am tempted to say something in general about viscera. Some American behaviorists have suggested that classical Pavlovian conditioning is confined to autonomic or visceral reactions and so is not too important. I do not agree to the formulation. But even if I agreed, I do not see why visceral conditioning is so unimportant. After all, our viscera are with us all the time, you can't get rid of them, and they keep on learning, whereas the Lord has not provided us with levers to pull or buttons to push—or even to peck at!

6) The Russians have several laboratories of what they call evolutionary physiology in which they compare conditioning throughout almost the entire animal kingdom, from hydras to horses and from ascidians to apes (*33*), whereas we, concentrating as we do on one or two species, are in danger of losing comparative psychology or comparative behavior as a separate discipline or area of knowledge. Liberson has praised Russian work in this area. I have space only to mention one other comparative area, which Liberson has not reviewed—namely, that of human ontogeny, comparative conditioning characteristics in infants and young children. The Russians have developed here what might be called Gesell-type or Kuhlmann-Anderson-type scales. While we have scales of capacity, they seem to have scales of modifiability (*34*).

7) Another significant area of Soviet psychophysiological research is that of sensory interaction. The field was surveyed by Ivan London in the November 1954 issue of the *Psychological Bulletin.* London's bibliography is quite complete, and his brief summary of the Russians' main findings is generally accurate. However, his doubts and disparagements of the findings are either unjustified or in need of definitive qualifications. He states, for instance, that there is "ready evidence of inadequate instrumentation" in the Russian experiments, but nowhere does he mention what the evidence is. The laboratories of Lazarev (*35*) and of Kravkov (*36*), the chief interaction experimenters, appeared to me—and to others—quite well equipped in 1934, and recent diagrams and photographs of Soviet sensory apparatus surely reveal an advanced level of technical skill (*37*). Lazarev was a trained physicist as well as a physician, a physiologist, and a member of the Russian Academy of Sciences before the Revolution, while Kravkov, a corresponding member of the Academy, was the only psychologist to attain that rank, either before or after the revolution. Kravkov also had, as far as I could ascertain, special training in physics and engineering and is, incidentally, *the* psychologist mentioned in the *Large Soviet Encyclopedia.* If you doubt the work of these two, you might as well doubt everything about Soviet science.

London's criticisms of the Soviet experiments for "primitiveness in the statistical treatment of data" and poor reportage are largely well founded, but not basic with respect to the main validity of the findings. I recently subjected the data of 300 Russian experiments on salivary conditioning (the statistical level of which differs but little from that of experiments on sensory interaction) to tests of significance and found that in only 29 percent of the cases did the stated Russian results fail to reach the conventional 5-percent level of confidence. Likewise, my earlier and less extensive qualitative treatments of Russian data showed the behavioral findings to be *mostly* statistically reliable. Inadequate statistics is, as is known, a general characteristic of reports by physiologists, though the Russians are no doubt guiltier that the rest—a curious phenomenon in view of the advanced state of their mathematical statistics and electronic computing machines (the latter field was cited by E. Teller in a press statement as being among the few areas in which the Russians are superior to us).

Little need be said about reportage. Our practice of writing elegant reports, of often spending more time on writing up an experiment than on doing it, and of stressing strict editorial supervision of style and organization is, by all tokens, not shared by the Russians, and they may be right.

8) Finally, it might be worth while to mention Soviet practical animal training. To realize its highly advanced level, one would have to see the commercial film *Animal Theatre,* with its complete animal orchestras, animal trains, elephants ringing bells, dogs selling tickets, chickens punching the tickets, flustered rabbits missing the train, cat conductors, and the like (*38*). Animal training is, in the Soviet Union, as a rule under the supervision of leading scientists; their animal space training is, for instance, according to the *New York Times,* under the direction of Vladimir Chernigovsky, whom I recognize as the head of the Laboratory of Receptor Physiology of the Pavlov Institute of Physiology and as an outstanding student of interoception and interoceptive conditioning. And, incidentally, the training is carried on in operant or reward fashion, which, of course, the Russians simply call conditioning (*39*). "Conditioning reflexes and patience is all you need" says one of their animal-film commentators.

Psychology: In Search of a Synthesis with Marxism-Leninism

Turning now to the development of psychology proper in the Soviet Union, we are confronted with a totally different picture—with few achievements and lots of trials, woes, and tribulations. Unlike Soviet psychophysiology, Soviet psychology has been in its very core Communist-constricted all the way along, the degree of constriction being a monotonic function of the degree of Stalinism, and having lessened only in the last three or four years. And unlike the steady curve of research and thought production of

Soviet psychophysiology, the curve of production of Soviet psychology has been spotty, at times quite scanty, and at other times practically "nilly." And surely the course of underlying systematics of Soviet psychology has, unlike that of Soviet psychophysiology, been very uneven, very nonautochthonous, typically tortuously zigzagging, and not uncommonly paroxysmally self-destroying.

I shall divide the Communist constriction into three periods: 1917 to 1930, 1930 to 1936, 1936 to the present. The constriction that existed between 1917 and 1930 might be called self-constriction. There is no evidence that the Communist party or state actually told psychologists what to think or do or what not to think or do during that period. It was the psychologists themselves who tried very hard to accommodate their views and work to Communist thinking and to the objectives of the Soviet state. And since Communist thinkers—Marx, Engels, and Lenin—had few, if any, specific thoughts on systematic psychology, and since the objectives of the state were also more or less seesawing in the '20's, there was an almost free-for-all fight among the psychologists for the final common path or final Communist path: Which psychology should become the Marxian psychology? (Of course the idea of possibly letting more than one flower bloom never occurred to their minds, I suppose. Or did it?)

The constriction of the period between 1930 and 1936 I would designate as Communist-psychologist constriction or interference. It begins with the Communist cell of the Moscow Psychological Institute initiating a series of discussions of the basic premises for a Marxian psychology, primarily a criticism of the then-established Kornilov reactology. What happened was that Lenin's *Philosophical Notes* were published in 1929 and some treasured commandments of dos and don'ts for psychology were presumably disinterred; hence there followed an era of self- and other chastisement, name-callings, accusations, imprecations, recriminations, and related such and sundry niceties. The periodicals *Psikhologiya, Pedalogiya, Psikhotekhnika,* and *Psikhonevrologiya* of the period teem, as it were, with Gaston-Alphonse compliments of mechanistic, idealistic, biologistic, sociologistic, and fatalistic geneticism, fatalistic environmentalism, abstractionistic functionalism, and so on and on.

Finally, the period of mere words passed and the period of real action and full-powered Communist control was ushered in—the purge of pedology, psychotechnics, and mental testings, in 1936. And this control continued unabated—at times augmented—during Stalin's lifetime, relented somewhat after his death, but has by no means disappeared even now, the course of the control following indeed in all respects the course of Communist control and "partyization" of related intellectual endeavors. Why should psychology be different?

Systematic Views: Reflexology

On the other hand, with respect to systematic views, four periods seem to stand out in the Soviet era: 1917 to 1923, the "reflexological" period (*40*); 1923 to 1931, the "reactological" one (*41*); 1931 to 1950, which I shall call "unanchored cognition" (*42*); and 1950 to the present, "anchored cognition" (*43*). The reflexological period is the one in which Bekhterev's reflexology, coupled with American behaviorism, came pretty close to becoming the official Soviet psychology. Pavlov's experiments and views were used in the enterprise, but Bekhterev and his disciples were the moving spirits, Pavlov himself being indeed not at all involved. True, Pavlov became interested during the revolution in experimental neurosis, the concept of sleep as inhibition, and psychopathology in general. But these interests were, I presume, results of accidental circumstances and not of ideological influences. Pavlov could not take, in 1918, his summer vacation in the country, he did not want to experiment during the summer (he never did), so he decided to spend two months working in a clinic, just about the time when the semistarved condition of his dogs made them lethargic and demented and neurotic—and supplied Pavlov with new ideas and pursuits.

On the other hand, Bekhterev set out, right after the revolution, to inweave his reflexology into the Soviet system. He published a monograph on *Psychology, Reflexology, and Marxism* and an article, with Dubrovsky, on "Reflexology and dialectical materialism" (*44*), trying to show that reflexology is the proper Marxian and dialectical psychology. He became the editor of a periodical, *Problems of Studying and Training Personality* (*Problemy Izucheniya i Vospitaniya Lichnosti*), in 1919, and set up in his Brain Institute divisions of genetic reflexology, pathological reflexology, collective reflexology, pedagogical reflexology, and "what-not" reflexology. His associate Sorokhtin developed theories on associative sex tensions to replace Freudianism (*45*), and he and his associate Polonsky experimented with mutative or emergent characteristics of associative reflexes (*46*), presumably as substitutes for *Gestalt* principles. The reflexologists were very active in research and, in their own way, very fruitful in hypotheses. Had they continued unhampered, they no doubt would have made significant contributions and probably would have developed a psychology not very different from what some of our behaviorists would like to have. But the school was declared too mechanistic for Communist philosophy and slowly passed out of existence.

Reactology

Kornilov's reactology was a school of psychology that let the physiologists study the reflex while keeping to itself the study of voluntary reactions or voluntary behavior. Its methodology was primarily objective, but it did not completely disdain introspections—particularly introspection of the Würzburg variety—as a method of preliminary private survey. The school also contained a principle of *wholeness*—that total behavior dominates individual reaction behavior and social behavior dominates individual behavior—and a principle of *socioeconomic prepotency*—that, while the form of reactions may be determined biologically, their content is social, specifically economic, and man in general is a variate or function of a particular economic class. The school was certainly wider in scope than reflexology and no less experimental and, if permitted to exist, would no doubt have been of considerable significance. [A good example of a reactological approach to psychology is Luria's studies of affective reactions (*47*). Both Luria and Vygotsky (*48*) were students of Kornilov (*49*), though they later founded a school of their own.] But, as already indicated, reactology, like reflexology, was declared undialectical and inadequately Marxist-Leninist, in 1931, and its fate, too, was, naturally, thereby sealed. The charges were: Man as a mere reacting organism is too passive a

concept for Leninist activism; reactology leads to psychophysical parallelism on the one hand and to epiphenomenalism on the other, either of which is at variance with dialectical materialism; and, in simpler terms, reactology fails to accord consciousness its directing, controlling role in transforming man, society, and nature (*50*).

Unanchored Cognition

Whatever it had been, from there on Soviet psychology became what we might call a cognitive psychology. However, it came to be a very special kind of cognitivism, rejecting as it did Gestalt psychology, phenomenology, functionalism, psychoanalysis, the Würzburg school, and, indeed, whatever cognitivists had worked at. What it most resembled was a very naive, common-sense 18th- and 19th-century-vintage cognitivism, bordering on scholasticism, and it is for this reason that I called it "unanchored." Man is controlled by his goals, wills, purposes, conscious needs, thoughts, duties, and so on, but these categories are in no way empirically delineated, measured, or even adequately described. One student of Soviet psychology (*51*) calls this period "the New Man in Soviet Psychology" and stresses its rational aspects. But it is really an old-man, or, better, a new old-man, period—the old rational "faculty psychology" of the German Christian Wolff (whose book *Rational Psychology* appeared in 1734) Marxistically peppered. The acid test of productivity reveals an extreme sterility, a near absence of any significant psychological research and any specific psychological thought between 1936 and 1950, and present-day Soviet historical surveys and bibliographies reflect a glaring hiatus in psychological publications of that period. Perhaps, this will demonstrate to our own extreme cognitionists that, to succeed, a cognitive approach in psychology must be tied to something empirical and isolably concretizable—must reach beyond its own circularity.

Anchored Cognition

I designated the current (since 1950) systematic position of Soviet psychology as one of "anchored cognition." By this I mean that, while present-day Soviet psychologists continue to accord supraphysiological status to traditional psychological cognitive categories, they nonetheless insist that these categories are wholly unviable—indeed hopelessly sterile and reactionary—if there is no study and understanding of their material basis, Pavlovian physiology. Thinking and imagination are thus, for instance, tied to Pavlov's concept of language as a "second-signal system," and perception is tied to Pavlov's investigatory or "what-is-it" reflexes. The tie-up does not represent, as is known, a natural evolution of theoretical-experimental views but has come about as a rather forced affair. From 28 June to 4 July, 1950, the Soviet Academy of Sciences met jointly with the Soviet Academy of Medical Sciences and resolved "that psychology, psychiatry and a number of related fields be reconstructed on the basis of Pavlov's teachings" (*52*).

Just what this forced marriage of Pavlovian physiology and cognitive psychology will lead to it is as yet, perhaps, too soon to gauge. So far, however, the benefits seem to be only unilateral, benefiting physiology or psychophysiology but not psychology or cognitive psychology. After a few years of trying, Soviet psychologists are beginning to contribute significantly to such areas as verbal conditioning and physicalistic studies of perception (*53*), but, except for formal lip service, they do not seem to manage to relate their contributions, and the contributions of their physiologists, systematically to key problems of cognitive controls. The task is of course generally difficult. But in the case of Soviet psychologists there is the additional handicap of needing cognitive formulations that counter traditional and "bourgeois" equivalents. As already indicated and as might be suspected, in Soviet ideology cognitive psychology (not unlike literature, art, philosophy, and the social sciences) is much more class-construed and class-angled than are psychophysiology, physics, and engineering. Soviet psychology must constantly prove its Marxist-Leninist nature, whereas Soviet psychophysiology need not do so—at least not to the same degree—its very advancement being assumedly in itself the right unfolding of the Soviet physicalistic (or materialistic) world view. There is thus much more freedom for research and thought in the latter discipline than in the former, and even in the Soviet Union students and scientists are drawn to freedom. In fine, the incomparably greater progress of Soviet psychophysiology as compared with Soviet psychology is not just a matter of differences in subject matter and of the Pavlovian traditions but also (and perhaps more so) of the different relations of the two to the Soviet state and philosophy.

Ideological Correlates

Viewed differently, one might say that, while Soviet psychophysiology is a "learn from" area, Soviet psychology is, so far, mostly one of "learn about" (that is, we may learn from Soviet psychology more about the Soviets than about psychology); or that, while Soviet psychophysiology may provide us with knowledge, Soviet psychology furnishes us mostly with only a "sociology of knowledge." One must avoid, however, temptingly facile generalization about the relation of general Soviet ideology to specific works and views in psychology without considering psychology's autochthonous development and its basis of psychophysiology—such generalization, for example, as the suggestion that Soviet psychologists had not been interested in the "law of effect" because the "law of effect" means "tension reduction" and "tension reduction" is too passive a concept for Soviet activism (*54*). Obviously, the "law of effect" may also mean "reward-getting" or "pleasure-seeking" and thus may be a very active concept. The simpler, and historically and systematically truer, explanation is the fact that Pavlov's associationism is not a "law of effect" type. Neither is the associationism of Guthrie or Tolman, whose views we don't tie up, I hope, to their ideology or politics.

In fact, the very adoption, in the Soviet Union, of a particular school of psychology may well be based on other than an intrinsic relationship to Marxian ideology or Soviet objectives. Psychologists in East Germany, under the leadership of Kurt Gottschaldt, are at the present time mostly *Gestalt*-oriented, and one of them, Hans Hibsch, argues in a recent Russian periodical that the concepts of *Gestalt* and *Ordnung* are Marxian and dialectical (*55*). Yet East Germany is otherwise very much in the orbit of orthodox communism. Again, it is known that Leon Trotsky had in the early 20's advocated the adoption of psychoanalysis, indeed a synthesis of Pavlov and Freud. In picturesque language, Trotsky is quoted by Shemyakim and Gershonovich to have said: "In the well of knowledge, Pavlov sits at the bottom of the well minutely probing its contents and topography, whereas Freud uncovers the same well's contents and topog-

raphy by penetratingly gazing from the top" (*56*)—and I might add that the Marxist-Leninists of Israel are deeply involved in Freud-Marx-and-Lenin syntheses (*57*). There is no doubt that the chief reason for the dominance of reflexology in the Soviet Union of the early '20's, and for the resurgence of Pavlovianism in 1950, is the fact that Pavlov and Bekhterev were Russians. It could have been otherwise. (A lot of things could have been otherwise in the Soviet Union: It could have been Beria or Molotov instead of Malenkov, or Malenkov or Zhukov instead of Khrushchev, and even Trotsky instead of Stalin.) Of course, when "thiswise" is adopted, "otherwise" gets condemned and "thiswise" gets coordinated; hence, Gestalt psychology is probably not likely to hold out long even in East Germany. Pavlovianism has now already become the official psychology of Czechoslovakia, of the Balkan countries, and, to a considerable extent, also of China and Poland (*58*). The iron curtain brooks no unclosured loopholes in its *Gestalt*.

Behavioral Sciences in the U.S.S.R. and the U.S.

Permit me now to end this long article by a short word on the relative status of behavioral sciences and of scientific knowledge of behavioral control in the Soviet Union and in this country, with particular reference to the recent statement in the press by a group of behavioral scientists that the behavioral sciences in the Soviet Union are Communist-constricted and lagging behind. As I have pointed out, this is surely true with respect to psychology proper, and it is even truer—much truer—with respect to several social behavioral sciences. But it is not true—not at all true—for Soviet psychophysiology, which has kept up a steady record of significant achievements and a steady and consistent non-Communist—rather, supra-Communist, supra-everything—wholly empirical point of view and orientation. And it is this psychophysiology which is—most of you may agree—the scientific core of the behavioral sciences, and which, with its drug effects, its interoceptive and verbal conditioning, its neurology, pathology, and pharmacology of learning, may hold within itself the possibilities of real breakthroughs in the scientific control of human thought and action. So, it is sad and disconcerting to have to state that American psychologists and behavioral scientists know so little about Soviet psychophysiology, know indeed less—much less—than American physicists know about Soviet physics (*59*). And then there is also the consideration that, in general, the Soviets possess a readier and more responsive machinery for transforming behavioral knowledge into behavioral applications; that they control their applied psychologists and behavioral scientists more completely than we do, or want to do, ours, not letting them, shall we say, become too "diluted" by popular client-orientation; and that, while they may suffer from a too-orthodox theoretical rigidity, we, on the other hand, may suffer from a too heterodox theoretical fragmentation and individual-system aggrandizement. The situation as a whole thus contains elements of concern and calls for more knowledge and work; greater familiarity with, and duplication and verification of, the Russian work; and less complacency and ethnocentricity. The need to catch on, catch up, and surpass in vital areas of psychophysiology and the control of men may not be very different from the related requisite in physics and the control of missiles.

Summary

Pavlov's experiments, begun long before the revolution, have always been generously supported by the Soviet state. However, their far-reaching ontological and methodological implication gained an official and commanding position to Soviet biomedical and psychosocial (as distinct from socioeconomic) sciences only in 1950 with the Resolution of the 28 June–4 July Joint Pavlovian Session of the Soviet Academy of Sciences and Academy of Medical Sciences. In the biomedical sciences, present-day Soviet Pavlovianism may best be conceived of as (i) a doctrine of *nervism* (a Russian term)—the ubiquity of neural control of bodily reactions (neural, neurosomatic, neurovisceral, and neurohumoral) and (ii) a doctrine of what might be called *concomitantism* (my term)—the ready and radical modification of these reactions by concomitant reactions; or, viewed more generally and somewhat differently, as (iii) a far-reaching *physicalistic psychosomaticism* or, rather, a *neuroviscerosomaticism*. Psychophysiology—or higher nervous activity—is the key discipline here. With scores of research institutes, it is indeed a very well-established, wide-scoped, and far-advanced science that, in both present achievements and future capabilities, is a challenge to American and Western equivalents.

On the other hand, in the psychosocial sciences and the key discipline of psychology proper, unmitigated Pavlovian physicalism and objectivism is met head on by (i) the unbending postulate of dialectical materialism of "the specific emergent efficacy of consciousness and subjective conscious categories" as well as by (ii) the simple consideration that a consistent Pavlovianism is a fully autarchic psychology and needs no other science of psychology on top of it. A large portion of current Soviet psychological theory in psychology proper is thus primarily a textual and exegetic collation and conciliation of the views of Pavlov with those of Marx, Engels, and Lenin (until recently and, to some extent even now, also of Stalin), just as most current Soviet psychological experimentation in psychology proper is primarily a duplication of what Soviet psychophysiology could do as well, if not better. Moreover, there is the long-standing drastic ban on intelligence testing, psychoanalysis, Gestalt psychology, and other to-be-shunned "bourgeois-psychological" thought-and-practice systems, so that, in all, psychology proper is a much constricted and, per se, more ancilliary than basic discipline of Soviet empirical research—a state of affairs plainly reflected in the fact that the number of its research institutes and publications (as well as the number of psychologists proper) is but a small fraction of the number in psychophysiology. Yet, in evaluating our efforts in the area vis-à-vis those of the Soviets, we must, obviously, take full account of both disciplines, Soviet psychophysiology being in all respects a psychology in American terms (*60*). Indeed, it is Soviet psychophysiology, and not Soviet psychology proper, that is the homolog not only of American behavioristics but also, to a large extent, of all American experimental psychology.

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C. F. Roos, Econometrician and Mathematician

A rare combination of talents in mathematics, economics, and statistics and a continuing activity in science, business, and public affairs, together with organizing and managerial ability and vast energy, made Charles Frederick Roos a unique and outstanding figure. His varied services over many years to the American Association for the Advancement of Science make his sudden death from coronary thrombosis, on 7 January 1958, a matter of concern to members of the organization.

Born in New Orleans on 18 May 1901, Dr. Roos studied at Rice Institute and received from it the A.B., A.M., and Ph.D. degrees in mathematics in 1921, 1924, and 1926, respectively. His main interests in his graduate work were the calculus of variations, integral equations, and the applications of these areas of mathematics to economics. His principal adviser was G. C. Evans. He spent the two years from 1926 to 1928 as a National Research fellow at the University of Chicago, Princeton University, and Cornell University, and became an assistant professor of mathematics at Cornell in 1928. He resigned this position to become permanent secretary of the American Association for the Advancement of Science, in 1931. This office, later abolished, he once described as "permanent like a permanent wave." While at Cornell he was also secretary of Section K (Social and Economic Sciences) of the AAAS and was active in arranging programs in economics at the annual meetings. With the onset of the severe depression of the 1930's, he arranged a symposium on unemployment at one of these meetings, and the papers presented were later published by the AAAS under the title *Stabilization of Employment.*

Dr. Roos resigned his position as permanent secretary in 1933, on receivng a Guggenheim fellowship to work in England on mathematical economics. But the fast-moving events of that year