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PREFACE

(U) This report deals with the state of the art in Soviet Psychology in the areas of behavior modification, psychosurgery, psychopharmacology, parapsychology, and engineering psychology. Background material is contained in an appendix. The summary is an intelligence overview containing the best available estimate of what areas are relevant from a military and military-political standpoint. The time estimate clearly gives projections as to when major relevant areas of research will become operationally ready and/or more efficient.

(S) The current collection efforts in the behavioral and physiological sciences are inadequate. There are serious gaps in our knowledge concerning what laboratories, people, and institutions are doing work in advanced psychopharmacology. It is known that the Soviets are expending a considerable effort in this area but we are not sure what their results are.

(U) Request any amplification of subject matter, constructive criticisms, comments or suggested changes be forwarded to the Defense Intelligence Agency (DT-1A) Washington, D.C. 20301.

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SUMMARY

Emphasis

(S) The Soviet Union is conducting highly creditable and sophisticated research in the behavioral sciences and has been doing so for the past 10 to 15 years. The main areas of emphasis are in the fields of psychopharmacology, psychobiology, parapsychology and human factors. Over the past 10 to 15 years there has been a significant shift towards a multidisciplined approach in their research efforts. The most obvious examples are their investigation of the synergistic effects of multiple drugs, drugs combined with physical stimuli, like ultrasonic and electromagnetic fields, and team efforts in parapsychology by engineers, psychologists, and medical investigators. The potential uses of telephatic communication and psychokinesis are clear in highly sensitive military and political areas. A great deal of effort is also being expended to borrow Western ideas and expertise in this field. In psychopharmacology their research into the biochemistry of memory and emotional behavior in human subjects may produce significant breakthroughs. Increased intelligence collection efforts in this area are needed.

(S) Their major goal in the overall area of behavioral research is to make significant breakthroughs in the fields of psychopharmacology and parapsychology. Another area of significance is refining and enhancing the field of human factors. Apparently this problem is recognized as evidenced by a long history of equipment maldesign in critical military and industrial man-machine interfaces. Politically they are novices in dealing with noncaptive populations. The Soviet hierarchy traditionally dictates policy but this approach is becoming less effective, as seen in Egypt. To resolve this sledgehammer approach the newly found "social psychologists" are very busy incorporating Western ideas in the remotivation and control of alienated subgroups. The approach is most typically non-Soviet since even many of their scientists apparently don't consider this a viable option.

(S) In the military sphere their most significant goals are to (1) improve their man-machine interfaces, (2) find quick and easy ways to demoralize, influence or debilitate the enemy, and (3) find more effective methods to mold, influence and control the vast military forces politically at their disposal. A corollary effort, at a much smaller scale, is the development of more sophisticated means of surgically, chemically, or

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psychophysically controlling behavior in a nondibilitating or overtly detectable manner.

Level of Effort

(S) The Soviet Union is spending a considerable amount of money on psychological research. B. Lomov expects to expand his present contingent of 250-300 Ph.D.'s by 1980. This effort is both overt and covert and deals primarily with human factors, psychopharmacology, and psychophysics. Their leading scientists are very competent and are extremely interested in international knowledge and exposure. Scientists like Luriya, Lomov, and Kogan are still playing major roles in this discipline. Since Luriya's recent death the leadership in neuropsychology will probably be taken by N. P. Bechterevz of the Institute of Experimental Medicine in Leningrad.

(S) Most military oriented research in psychopharmacology and parapsychology is being done by persons unknown. The leading researchers in these fields have been isolated from the international arena include B. D. Lomov, V. Venda, N. P. Bechtereva, N. N. Konovalow (Director of the Burdenko Institute), I. M. Kogan, E. Naumov. Most scientists doing relevant work in important disciplines have been placed in highly directed, non-publicized research teams. The Burdenko Institute of Neurosurgery (Moscow) and the Pavlov Institute of Physiology (Leningrad) are continuing in relevant psychological research. This effort has been expanded to numerous laboratories. These include: the Institute of Neurology (Moscow), the Institute of Neurosurgery (Leningrad), the Institute of Experimental Medicine (Leningrad) the Scientific Research Institute of Neurosurgery (Kiev), and the Institute of Experimental and Clinical Neurology (Tbilisi).

(S) The Soviets are most competent and have the greatest expertise in psychopharmacology, especially as it pertains to human subjects, and parapsychology. Their greatest difficulties lie in experiment design, philosophical dogma, and digital computers to do the sophisticated statistical analyses. Their poorest work is in experiment designs dealing with higher order behavioral observations such as complex human learning and emotional behavior. Traditionally, most of the research in the Soviet Union has dealt with physiological measures such as miographic, galvanic, and encephelographic recording. They are also still doing research with poorly selected or very small samples and tend to use very subjective measures to describe their results.

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(S) The major problems at this time limiting their effectiveness are their inability to handle their scientific information explosion and the apparent political-personal scientific suspicions that result from a highly structured party-oriented, bureaucratic hierarchy. Political infighting often results in unqualified party appointees being installed in highly sensitive and responsible positions, although much of this has seemingly been resolved by B. Lomov in the laboratories and projects he controls. Under Lomov's guidance recent problem solving has been done in a nonpolitical pragmatic way. The Soviets have abandoned their philosophy of waiting for Soviet technology to catch up to the West and are now purchasing very sophisticated hardware equipment and talent available internationally. They are actively seeking and obtaining foreign talent and equipment necessary to complete high quality research in every facet of the behavioral sciences. Another major problem facing the leadership is a widening generation gap leading to potential morale and discipline problems within the military. In the past the leadership was able to rely on the near fanatical nationalism resulting from World War II experiences such as the fall of Leningrad and Stalingrad. The concept of "Mother Russia" is not felt as strongly in the younger generation. The very real problems resulting from rapid urbanization, industrialization, increased affluence, and exposure to Western literature are being felt today. Future motivational dilemmas are being studied because the leaders are now aware that the magnitude of the problem will increase with time as the effect of greater affluence and mobility takes hold.

(S) The main problem the Soviet Union has had in conducting psychological research is the nonavailability of sophisticated laboratory grade equipment which includes precision physiological and neurophysiological devices. This problem is being resolved for the major research efforts by the wholesale purchase of foreign machinery particularly from Japan and in wholesale invitation to foreign scientists. The Soviet Union has the requisite expertise and motivation to produce major breakthroughs in several areas of the behavioral sciences. This has been made much more likely by an apparent total commitment to excellence in their scientific endeavors which includes purchasing whatever they need to conduct this type of effort.

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Soviet Psychology

Introduction:

(U) The history of psychology in the Soviet Union does not parallel the development of psychology in the United States and other Western countries. Psychology in the West is rooted in philosophy and biology. In the USSR psychology developed almost entirely out of the physical sciences and modern Soviet psychology continues to reflect it's "hard science" origins. Psychology as a separate and identifiable scientific discipline has not really existed in the USSR as it does in the West. Rather, it has been fragmented as parts of more historically traditional sciences; specifically, physiology, biochemistry, anatomy, engineering, pharamachology and medicine.

History and Scientific Principles:

(U) In the Soviet scientific community psychology is defined as the study of mental (psychic) activity. It must be understood at the outset that Soviet psychologists have never been caught in the philosophical bind of trying to separate mind from it's physical bases as were early Western psychologist. Soviet researchers from the beginning were concerned with brain function and the physical correlates of behavior. An exhaustive search of Soviet behavioral science literature fails to surface anything approaching the fantastic proliferation of theories and counter theories to explain human behavior which developed in Western countries. The Soviet's rigid adherence to the concept of dialectical materialism in science literally forced the Russian scientific community to direct it's research efforts toward examination of the physical aspects of behavior and away from the more philosophical, religious and metaphysical aspects of behavior.

(U) Psychology, as it is known in the West, had a difficult, uphill, beginning in the USSR. Prior to 1917 it was considered to be an alien inspiration, religious, idealistic and far from anything resembling a true scientific discipline. The revolution did little to change the official position towards psychology. The "Party" leadership over the years continued to place psychology in a pseudoscience position, subordinate to

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the traditionally recognized physical sciences. The overall result of the official party position was to frustrate many dedicated researchers in this field and to splinter psychological research into other more traditional disciplines, particularly physiology, pharmachology and medicine. This situation remained more or less prevalent until 1968 when the first doctoral degree in psychology was offered. Further support and recognition for psychology came from the 23rd Congress of the CPSU which lead to a reorganization and consolidation of psychological research under the direction and guidance of B. D. Lomov.

(S) Since Lomov's rise to prominence there have been fundamental changes in Soviet psychology. He has apparently been able to make changes in the overall stature of Soviet psychology that would have appeared impossible 10 years ago.

(S) The most significant changes in behavioral sciences research instituted by Lomov are outlined below:

a. Reorganization and increased central control of USSR research to avoid duplication, improvement and modernization of research facilities, and the institution of a team concept for research in interdisciplinary areas such as engineering psychology and psychobiology.

b. A significant reduction in Marxist/Leninist dogma in research writing.

c. Emphasis on broadening the scope of research to include cybernetics, parapsychology, engineering and industrial psychology and most surprising, social psychology, an area that has been for the most part ignored in the USSR.

d. A pragmatic and realistic approach to research including procurement of equipment rather than waiting for Soviet technology to catch up, scientific personnel exchange programs, and participation in international symposia. A good example of the willingness of Soviet scientist to buy Western technology is Academician A. R. Lurias's (recently deceased) neurophychological assessment laboratory in the Burdenko Neurosurgical Institute. The laboratory contains an East German X-ray unit, French and Hungarian tomography machines and an American made brain scanner.

e. Recent acknowledgment and recognition of industrial psychology as a means to evaluate and correct industrial production problems and employee motivation difficulties.

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f. An overall increased emphasis on improved research design, use of control subjects in experiments, eliminating institutional bias on research results and the introduction of sophisticated statistical techniques.

(S) It seems clear that Lomov has the Party support, budget and personnel necessary to totally modernize Soviet psychology. The apparent consolidation of policy making power for the direction of behavioral sciences research under one man and the obvious high level of authority granted to Lomov has resulted in fundamental and rapid changes in the progress of Soviet behavioral sciences. The remainder of this paper will be directed at assessing the current Soviet "state of the art" in specific areas of psychological research. Particular emphasis is placed on identifying significant differences in methodology and philosophy between Soviet and Western research programs. Whenever appropriate, trend analyses will be attempted with specific attention being given to the development of potential offensive uses of new technology.

Assessment of Current Efforts:

Behavior Modification

(U) Behavior modification covers a wide spectrum of psychological research and one might convincingly argue that every subdiscipline in psychology deals with the control and modification of behavior. As one might expect from studying the history of Soviet psychology much of the work in behavior control in the USSR is concerned with direct, physical intervention. Chemical, surgical and other physical intervention techniques will be dealt with in separate sections.

(S) Perhaps the most significant development in Soviet psychology in the past ten years is the sudden acceptance and concomitant spread of industrial engineering and social psychology. It appears as though the Soviets are very rapidly becoming aware of the limited effectiveness of conventional Soviet incentives on the new generation of industrial and agricultural workers. It appears that Lomov was able to convince the CPSU hierarchy that the time had come to try something more sophisticated than the "brute force and carrots" system to achieve higher production. Lomov somehow convinced the leadership that acceptance of modern motivational techniques such as job enrichment and organizational effectiveness, pioneered and advocated by Western psychologist, is essential. Additionally, human factors

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engineering was sold as a way to improve individual productivity. It is not altogether clear how Lomov was able to convince the Soviet leadership to reverse it's position on these "non-Soviet", "non-scientific", areas of psychology but the research literature following 1973 clearly reflects this change in philosophy. Perhaps the undeniable data indicating that both economic and population growth rates were declining was all the leverage that was needed. One might also speculate that a more affluent, better educated and cosmopolitan populous was becoming less responsive to the older, simplistic incentives.

Physical Influence

(S) Consistent with the Soviet history of using direct physical means to study behavior, is a wide spectrum of research reports dealing with the effects of external physical energy on the biochemistry, electro-chemical activity (EEG, ECG) and overt behavior of the organism. Their work with environmental noise does not differ substantially from the research being done in the West with the exception that Western researchers tend to observe overt behavioral consequences of noise while the Soviets tend to be more concerned with internal transient changes to the brain. Of particular note are a few reports of changes to the "blood-brain barrier" following brief exposure to specific sound environments. Since the blood-brain barrier is an evolutionary development specifically designed to protect the central nervous system from any substances which may freely enter other parts of the body tissue, this line of research may have great potential significance. At present the only way to study the effects of many chemicals on behavior is to introduce them directly into the cerebrospinal fluid. These studies may lead to the development of techniques allowing previously harmless drugs in the blood serum to enter the brain causing debilitating dyschemia.

(S) Soviet researchers are studying the effects of a wide variety of physical energy sources on behavior. Microwaves, ultrasonic fields, electromagnetic fields, ultra low frequency radio waves and others are being systematically investigated. Unlike Western researchers the Soviets are likely to try combination of energy sources or chemicals in combination with physical energy to evaluate additive or synergistic effects. An area of particular interest to the Soviets (judging from the number of reported studies) is the effect of ultrasonic frequencies on behavior. High intensity focused ultrasonic energy can produce irreversible damage to brain tissue. In fact,

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Western scientists have experimented with ultrasonic techniques to lesion previously inoperable cerebral neoplasms. The effect of moderate intensity ultrasonic energy on brain function is largely not understood. It is clear from the Soviet data that measurable and identifiable changes in brain chemistry and EEG activity result from prolonged exposure to ultrasonic energy. It may be too early to speculate that brain activity could be selectively activated using various regimens of ultrasonic energy, but it is clear that researchers in the USSR have recognized this possibility. Research in the West dealing with ultrasonic energy has been limited by ethical restraints restricting such treatments to subhuman subjects. By all outward indicators the Soviets are far less concerned with ethical restraints in the conduct of their research. They may well be evaluating the effects of ultrasonic energy (as well as other physical treatments) on humans and if so, may be closer to understanding it's full potential.

(S) In another area of related research the Soviets are actively evaluating forms of physical stimulation that may have deleterious effects on behavior. Particular emphasis is being placed on discovering visible light intensities and frequencies that will disrupt orientation or in any way impede normal cognitive functioning. Also of interest are the increasing numbers of studies evaluating the effects of ionizing and non-ionizing electromagnetic (EMR) fields on brain function. They are heavily engaged in research evaluating field strengths and modulation schemes which seem likely to influence behavior. It should be noted that EM fields are not detectible without special equipment, the energy can be focused and directed over relatively long distances and can be produced with very portable equipment. We know that high intensity EM radiation can be lethal but the effects of prolonged exposure to moderate or low intensity on humans is for the most part not known. Reported studies indicate that the Soviets are exposing subjects 5-30 mw/cm field strengths and measuring the electrical activity of selected cortical and subcortical structures. Additionally, changes in psychomotor activity, blood serum chemistry, seizure activity and chromosomal abnormalities are being recorded. There is every indication that human subjects are being used in this line of research. The military implications of this work seems clear. A significant technological breakthrough here could result in the development of an offensive weapon.

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(S) Soviet scientists are studying the effects of passing microwave energy through the brain. Passing a concentrated beam of microwave energy through an electrically active substance, brain tissue, will modulate the beam in a characteristic way. Changes in the modulation of microwaves which results from passage through nervous tissue would then be interpreted and in some way correlated to mental activity. A similar area of research deals with the effects of magnetic fields on the biochemistry of the brain. The Soviets are exposing animal brains to magnetic fields, sometimes in conjunction with oxygen deprivation. The purpose of the oxygen deprivation is not immediately clear. The principal goal of these studies appears to be directed at changing levels of the neurotransmitters such as 5-hydroxytryptamine (serotonin), epenephrine, norepenephrine and GABA (gamma animo butyric acid). The research reports indicate that they have had some success in selectively changing transmitter levels particularly in lower cerebral structures, especially the limbic system, hippocampus and the reticular activating system. These structures are known to be functionally related to emotion, memory, and levels of alertness. Although there is no evidence to suggest that research of this type is being conducted with human subjects, the Soviets have subjected human subjects to equally cavalier treatment in the past. Judging from the relatively high level of activity in this type of research, this area warrants close monitoring in the next few years for technological breakthroughs.

Psychopharmacology and Pheromones

(S) In the past ten years there has been a significant expansion in the use of drugs to study brain function and to treat brain dysfunction. Psychopharmacology can be conceptually divided into two broad areas: in the clinical setting to treat behavior abnormality and in the research setting to study brain function through direct chemical intervention. In both of these areas the proliferation of data is increasing. It is believed that the truly significant breakthroughs in the understanding and control of brain function will be found here. The next major discovery of this century in life sciences, following the discovery of the double helix and genetic coding, could be the unraveling of the biochemical substrates of memory. Herein lies the key to modifying the present limits of the human mind. In general, Soviet research in this area does not differ fundamentally from the work being done internationally. The use of

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drugs to modify and control behavior appeals to the Soviet psychologists because of their traditional background in the physical medical model. It is not practical to do justice to this vast area of research within the confines of this report. We will outline the major thrusts of the Soviet work and highlight their areas of significant competence.

(S) The major areas of interest in Soviet psychopharmacology are:

a. Use of psychotropic drugs to moderate mood state and increase the manageability of institutionalized patients (e.g. antidepressants, antipsychotics, etc.)

b. The use of drugs to facilitate or inhibit the formation of long term memory traces.

c. The use of drugs to modify intracellular genetic material.

d. The use of drugs to rehabilitate "nonfunctioning" "anti-Soviet" people.

e. The use of drugs to influence or facilitate extrasensory and paraphysical modes of human behavior.

f. The direct introduction of neurotransmitter facilitators or inhibitors into specific brain loci to study brain functions.

(S) It is interesting to note the recent increase in unfavorable publicity directed at Soviet psychiatry from the West. There is substantial evidence indicating that Soviet minorities, scientists, and intellectuals who openly dissent to government policy risk arrest and being diagnosed as an "acute situational psychotic", or some other nondescript syndrome. They are subsequently committed for "adjustment therapy" which may include a wide spectrum of treatment protocols including social isolation, sensory deprivation, physical restraint, hypnosis, and physical abuse. Of particular interest here is the apparent use of many classes of drugs which seem to be intended for experimental analyses rather than for treatment. "Patient" reports indicate that many psychotropic drugs including depressants and hallucinogenics are being used. In addition,

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nonconventional drugs including convulsants, algesiongenics, respiratory inhibitors and others, which would not ordinarily be used for behavioral problems, but may be used for brain research are being reported. It appears that these patients are being used as research subjects without their knowledge. Ethical considerations aside, the use of human subjects for psychopharmacological research offers the Soviet researchers a distinct advantage. By bypassing the laborious, time consuming and behaviorally imprecise animal research, rigorously adhered to in the West, the Soviets may achieve breakthroughs in the understanding of brain biochemistry. This potential warrants close monitoring in the future.

(S) An area of vital concern to the Soviets, judging from their level of effort, is the biochemistry of long term memory. Research in this area falls into two closely related categories; drug studies which attempt to enhance or retard the formation of the memory trace, and studies directed at defining the chemical substrate of memory. The overt Soviet research does not appear to differ significantly from the work done in the West. The research reports tend to be sketchy. Frequently it is difficult to determine dosage levels, subject species, behavioral variables measured and even the type of statistical analyses used. Their methodology, with a few exceptions, appears to be technically sophisticated.

(S) A research methodology which is quite prevelant in the USSR but not widely used elsewhere for memory research is the oxygen cathode technique. Basically, this is a chronic electrode implant that measures the metabolic activity at specific loci by recording pO_2 tension in brain tissue. Of particular interest is the use of this technique in the study of "verbal memory" which clearly indicates that it is being used on human subjects. This is not totally surprising since there is considerable evidence that chronic implants of electrical stimulating and recording electrodes have been routinely used with human subjects in the USSR. Chronic electrode implants in humans are normally used only to control severe antagonistic behavior, and are not done routinely for research purposes. The danger of a brain information gap exists. The use of human subjects in controlled experimental research gives the Soviet researchers an undeniable edge, especially when the research is directed at higher cortical functions such as memory, creativity, language and other distinctly human forms of behavior.

(S) An area of research having potentially great importance to the ultimate understanding of brain function is the work being directed at altering the genetics of the cell. A systematic

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search of the literature frequently reveals studies relevant to behavioral genetics. It is clear that the Soviets are very actively studying the genetic control mechanisms for behavior. Much of their research is specifically directed at modifying genetic material in microorganisms using chemicals and a wide range of physical stimuli such as radioactivity and electromagneitc energy. It is now clear that the encoding of memory is at least in part dependent upon the production of specific small proteins and polypeptides. Advances in the technology to artificially modify genetic material (DNA) will most likely lead to greater understanding of the RNA template mechanism for the production of proteins and polypeptides. Although there is no overt evidence that Soviet researchers are anywhere close to applying their research at the development of "synthetic" memory, the potential does exist.

(S) Available data, from Soviet sources, dealing with research on pheromones is quite limited. There has been a remarkable increase in research in recent years, directed at identifying the specific chemical structure of various pheromones, especially those which seem to control insect behavior. This sudden increased interest in pheromones is quite understandable. First, these substances are usually found in very minute quantities and the development of microanalytic techniques in the past ten years has made the systematic analyses of the substances feasible. Secondly, the most recent work with pheromones suggests that they are far more pervasive and far more powerful in their control of animal behavior than was previously known. It is clear that pheromonal communication is evident in a wide range of animal species. Specific pheromones have been identified for the following forms of behavior control in the species indicated:

a. Sexual attraction (insects, mammals, primates, man).

b. Species and individual identification (insects, mammals, primates).

c. Communication of stress, danger or threat (insects, fishes, mammals).

d. Territorial marking (insects, mammals).

e. Establishing social hierarchies (mammals).

f. Communicating source and quality of food source (insects).

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(U) These pheromones can be classified into two distinct categories: releaser pheromones that trigger essentially automatic behavior in the organism and primer pheromones that lead to long lasting changes in the internal physiology of the organism. An example of a releaser would be the pheromone that causes scattering behavior of distressed schooling fishes. An example of a primer would be the scent gland in some mammals that controls the menstrual cycle in the females of the same species. Another important factor in understanding pheromones is that some are chemically volatile and therefore, short acting, as in trail marking of social insects, and others are relatively inert and produce their effect for a very long time like the territorical pheromones of some mammals.

(U) There is ample evidence that man, like other primates, is subject to pheromones. It appears that this is limited to pheromones which control sexual behavior. For example, there is some evidence that males can detect women at the peak of their ovulation cycle through olfaction. Additionally, women housed in all female dormatories or in prisons tend to have their menstrual cycles become synchronized. This is thought to be under the control of progesterone related pheromones. There is little reason to believe, however, that human behavior can be fundamentally controlled by phermonal substances. Animal behavior, particularly the insects, can be controlled very effectively using pheromones. A perfect example of this is the almost total elimination of the destructive Gypsy Moth (Porthetria dispar) from the northeast of the United States by using traps baited with the sexual attractant pheromone for that species. There is a significant potential for the use of pheromones as a military weapon as well as for helpful purposes. There is no reason to doubt that the technology to develop pheromones as a weapon exists in the USSR. Several potential offensive uses of this technology come to mind and are listed below:

a. Helpful species of insects (e.g., fruit pollenators, insectivores) could be eliminated or greatly reduced in numbers by releasing sterile females which have had their sexual attractant intensified (hypersexuals).

b. Hypersexual pheromone females which have been prepared with bacterial agents could be released to mate and spread the bacterial agent. This could be especially effective with insects which are parasitic on various mammals or birds during their life cycle. Insects which are parasitic to migratory birds (e.g., mites) would be very effective for introducing bacterial agents.

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c. Destructive insects could be made hypersexual with sexual attractant and released. Selectively bred aggressive bees, destructive scale insects, leaf curlers and other forms of insect pests could be introduced and rapidly increased in numbers.

(S) These are just a few potential offensive uses of pheromone technology. Other, more creative, applications are most likely possible. There is no direct evidence that the Soviets are actively working in this area but they certainly have the competence, should they choose to.

Cybernetics and Engineering Psychology:

(U) The proceedings of the 4th International United Conference on Artificial Intelligence conducted by the Soviet Academy of Sciences, in 1975 emphasized the following areas:

a. Development of conceptual systemic analysis, based on artificial intelligence theory.

b. The task of planning activity of a robot with an artificial intelligence.

c. Development of dynamic programming systems.

d. Complete algorithm of unification of the associative and communicative functions.

e. Heuristic solution methods.

f. Automatic programming and debugging.

g. Improved data base management.

h. Speech comprehension and natural language contact with a computer.

i. Data control and computer interface by natural language.

j. Perceptive robot moving in a 3-D environment.

k. Decision making by man.

l. Psychological aspects of artificial intelligence.

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(S) This is a partial list representing a very wide field of Soviet endeavor in this area. Of particular interest is the extent these areas of interest are being exploited. There is great interest not only in better interface between man and digital machines via programming but also in bionics, artificial intelligence, and bioengineered man-machine interfaces. B. D. Lomov is personally interested in combining man-machine interfacing talent with medical expertise. The Soviets are engaged in data management and the retrieval dilemma. They are faced with a lagging technology in both hardware and software plus an information explosion where rediscovery is more common than retrieval. This has led to an obvious desire to import Western computers, software and expertise. There is also a noticeable decrease in adverse Party involvement in achieving this goal.

(S) Concerning the problem of more efficient man-machine interfaces, a great deal of effort is also being expended on "natural" computer languages and better interfacing schemes especially in the industrial sector. Being somewhat bound to smaller and slower processors and less reliable fast-access memory systems there is a desire to optimize the integration of computers into various problem solving tasks. Typical of this effort is the work directed at developing highly unstructured computer languages and interfaces that could be used by a greater portion of the scientific community. The ultimate step naturally is to program and execute computer programs by a simple man-machine interface such as voice commands. This means combining digital devices with highly sophisticated preprocessors that can manage, program and handle the programs and data for scientists. It appears that the Soviets see this as one of the only viable methods available to them to "preserve" highly talented brainpower and knowledge for future scientific exploitation. By forming closer bonds between highly talented men and machines it is obvious that these abilities would not be totally lost when these scientists die.

(S) Closely related to this field of pursuit is the highly integrated efforts that are being carried out in literally dozens of laboratories directed at understanding the physiological bases of mental processes sufficiently to enable their control by direct contact with electronic devices such as digital computers. These studies are being enhanced by a great

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deal of work with chronic and removable implants, with remote signalling to the cortex, limbic region and reticular formation. The object in many of the experiments is to control mood, wakefulness, suggestibility and level of activity. In addition to this, the next step is to attempt more sophisticated communication directly with the cortex and memory controlling mechanisms. If a breakthrough is achieved here, the potential consequences could be startling -- we could anticipate direct programming and data loading or unloading of the human brain. Although this is probably not an immediate threat the great deal of work that has been reported certainly suggests a high level of Soviet interest in this area. From a purely pragmatic viewpoint the "teaching" or programming of a human brain by these methods would have obvious advantages since much of what now takes decades could very probably be done in a period of months. This work may lead to direct connections between digital electronic computers and the human "digital computer", the brain. Even if the state of technology will prevent full utilization of this capability, it is almost a certainty that the Soviets have the capability to influence wakefulness, suggestibility, and aggressiveness by direct and remote means of brain stimulation. Their extensive experimentation with medium and high power microwave emanations is probably for these purposes.

(S) Other areas of apparent interest are artificial intelligence, cybernetics, bionics, and the psychology of perception, motion and decision making. These areas are very highly published. There seems to be an almost frantic effort to duplicate the functioning of man's brain by machines. The central theme of many of these efforts seems innocent enough since much of the research deals with controlling rather simplistic robots, rudimentary speech formation, sensor (eye)/appendage (hand) coordination and artificial sterescopic vision. A great deal of interest and support is being given to ergonomics. It is difficult to say whether the overall interest is to replace man, better understand him, or to control him. The Soviets are facing a serious manpower shortage, they are interested in deep space and ocean exploration and this technology could greatly affect their future success in industrial growth and the exploration of new frontiers. This overall area has apparently not gone underground as of the 1977 time period. It appears that they are trying to stimulate a great deal of thinking in their scientific community in this area for later expolitation.

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TIME ESTIMATES

Psychological Influence	Observable Results/Behaviors	Potential Military Uses	Estimated Operational Date
Behavioral Modification:			
Hypnosis	control, therapeutic	partial to total behavior control	operational
Energy fields (EMR)			
moderate (non-ionizing)	control, suggestive	mood/behavior changes	experimentally operational
severe (ionizing)	debilitation	disability, blindness, genetic changes	operational at moderate range (100-500 m)
Physical methods	fright, disorientation	morale, combat behavior changes	operational
non-detectable	debilitation, disorientation	mood, morale behavior changes	operational
Psychopharmacology:			
Depressants	depression, addiction	loss of will, depression	operational
Stimulants	elation hyperactivity, fatigue	fatigue, mood changes	operational
Hallucinogenic	disorganized, psychotic	mood, behavior changes	operational
Pheromones	unknown, irritation if non-human	unknown, debilitating if irritants severe enough	2-10 yrs
Various combinations	unknown	debilitation, drastic behavior/thought changes	2-10 yrs
Psychosurgery:			
Implants	semicontrolled behaviors	small groups-complete control	2-10 yrs
Stereotaxic	cure of physiological abberations & behavior control	cure of psychosis	experimentally operational
Mind Control with chronic implants	complete external control	robot-like behavior	2-15 yrs
Mind Memory Expansion (in conjunction with drugs)	extraordinary memory behaviors, etc.	direct cerebral-equipment linking and information transfer	10-25 yrs

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TIME ESTIMATES (Continued)

<u>Social Psychology and Ergonomics</u>:			
"cure" for alcoholism & other addictions	rehabilitation	lower accident rate	operational (with better techniques being investigated)
equipment design	better use of man's abilities	increased efficiency of present and future systems	operational (a great deal of effort is being expended to expand this effort)
Industrial motivation techniques	job satisfaction & efficiency	higher system's rehabilities	operational (efforts increasing)
Job enrichment/enlargement	job satisfaction, production	more efficient/effective military units	operational on a small scale
Western marketing & planning in consumerism	greatly increased efficiency	more capital available for strategic industries	operational on a small scale but increasing rapidly

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Appendix

Soviet Psychology

In the USSR, psychology is defined as the study of mental ("psychic") activity viewed as a function of the brain determined by the conditions of life, reflecting objective reality, and regulating the interaction between man and his environment. It incorporates the dialectical materialist concept of the unity of the physical and the mental and the inseparability of the mind from the physiological processes of the brain, and the vital role of the mind. Man's consciousness is regarded as the product of a prolonged historical development in which a decisive role was played by man's work and by verbal communication (Kostyuk, 1966).

The results of psychological research are considered to have a theoretical and a practical significance. The scientific knowledge of the mind constitutes an important component of our understanding of the nature of man. Psychology contributes to the theory of knowledge and to the formulation of a philosophical view of the world. It shares in the scientific organization of human work and is an essential ingredient of the theory and practice of education, both as regards the acquisition of information and skills, and the development of personality.

In the sense of political geography, Russian psychology became a "Soviet psychology" overnight, so to speak, as a result of the 1917 October politcal revolution. Russian psychology and, in its early years, the psychology of the USSR, were not essentially different from equivalents abroad. Psychology of this period, in and out of Russia, was characterized by a multiplicity of approaches and points of view.

Although it was, indeed, a branch of European psychology, Russian psychology developed a distinct intellectual, political and socioeconomic environment. Intellectually, this environment was characterized by a longlasting struggle between "materialism" and "idealism". Historically, in Russia, "idealism" stood for metaphysical speculation, "materialism" for science. This was a tradition, which can be traced back to M. V. Lomonosov (1711-1765), a many-sided scientist, scholar and man of letters, and A. N. Radischchev, a revolutionary writer. In the nineteenth century, materialism was the philosophical credo of the influential group of revolutionary

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democrats (A. J. Gertsen, V. G. Belinsky, N. A. Dobrolyubov, N.G. Chernyshevsky) and of such influential scientists as I. M. Sechenov (1829-1905), the "father of Russian physiology" and a proponent (Reflexes of the Brain, in Russian, 1863) of a physiologically oriented psychology. Materialism, historical and dialectical, is one of the bases of Marxism-Leninism, which became the sole and official philosophy of the Soviet Union. The questions of what constitutes a "truly Marxist-Leninist" psychology was not answered readily in the Soviet Union. In fact, the issue represented the focus of search and debate, frequently acrimonious, for many years. There was a whole file of "candidates", including several varieties of objective psychology: Bekhterev's reflexology, Vagner's biopsychology (human psychology as a part of comparative psychology), Bionky's behavioral human psychology, and Kornilov's reactology.

In the nineteen-twenties and early thirties, Pavlov's (and I. M. Sechenov's) views on the reflex nature of the mind tended to be rejected by Soviet Marxist psychologists as "mechanistic". Only later, Pavlov's concept of mental activities as the processing of signals by the brain became regarded not only as compatible with Marxism-Leninism but was important to the interpretation of the mind in the framework of (Soviet) dialectical materialism. But it could be argued that R in the S-R (stimulus-response) formula is an artificial "interruption of what is uninterruptable"; consequently, the concept would be contrary to the principles of dialectical materialism. It was the physiologist, P. K. Anokhin (1935), anticipating the cyberneticists' concept of feedback, who point out that each R is followed, in turn, by afferent impulses ("return afferentuation") which constitute information conerning the response act. At about the same time N. A. Bernstein formulated the concept of the "reflex circle", replacing the traditional "reflex arc". These were important new ideas in the physiology of behavior, but it was some time before they were incorporated, as its organic parts, into Soviet psychology.

In the nineteen-thirties consciousness was affirmed, ex officio, as the subject matter of orthodox Marxist psychology. In those years the Soviet psychologists began to consider in earnest the implications for psychology of the thought of V. I. Lenin, especially as formulated in his Materialism and Empiriocriticism and Philosophical Notebooks.

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In the mid 'thirties, psychology began to die on the vine. One after another, the psychological journals withered away. The July 4, 1936 decree of the Central Committee of the Communist Party, directed against "pedology", originally conceived as an interdisciplinary study of child development, had disastrous effects on applied psychology in general, and suppressed psychometrics for decades. Psychologists, lacking a journal of their own for some twenty years, sought refuge in the journals of education and philosophy.

In the early 'fifties, the insistence on the "Pavlovization" of psychology created further confusion and stress. In this "general-methodological" crisis, dogmatic Pavlovism threatened to "liquidate" psychology, since, it was argued, psychology lacked a valid subject matter. For ideological reasons, the development of whole fields of psychology (e.g., social and animal) were suppressed as "reactionary" and "lacking promise". Animal psychology was charged with being out of tune with Pavlovian principles. Stalin's death in 1953 provided relief from the pressures of "the cult of personality".

The outward symbols of rapid recovery were the foundation of a scientific journal of pscychology (Voprosy psikhologii, in 1955) and of a scientific society (Obshchestvo psikhologov, in 1957), the first all-Union psychological congress (in 1959), and the publication of a two-volume, historically oriented handbook reviewing the accomplishments of Soviet Psychologists (Ananjev et al., 1959, 1960).

Contacts with colleagues abroad were reestablished, and Soviet psychologists familiarized themselves, through an impressive number of translations, with the work accomplished during their isolation from the "West". The new trends, including a rapid advance in the area of engineering psychology and a hesitant exploration of the area of social psychology, were clearly visible in the program of the second all-Union congress held in 1963 in Leningrad.

The culminating event in this process of "opening the windows to the West" (and vice versa) was the eighteenth International Congress of Psychology, held in Moscow in August 1966. The same year saw the establishment, in Moscow and in Leningrad, of the first Colleges of Psychology--first not only in the Soviet Union but in the world.

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Current research activities are reflected in the program of the third all-Union congress of the Soviet Psychological Society, held in Kiev in June 1968 (Brozek, 1969). The percent (N = 906) of papers presented in different areas were as follows: philosophical-theoretical topics, 1.0; history, 1.2; psychophysiology, 2.2; general experimental, 20.7; personality and differential psychology, 5.9; engineering and industrial, 12.8; medical (incl. neuropsychology, psychopathology, and abnormal child psychology), 15.2; social, 3.8; comparative, 0.7; and physical education and sports, 7.8.

A major advance in the status of psychology was represented by the establishment, in 1968, of doctoral degrees in psychology. Prior to this, psychologists could receive a doctoral degree (denoting a substantially higher level of demonstrated competence than the European or the American Ph.D. degrees) "in pedagogical sciences, with specialization in psychology". Administratively, the 1968 decree marked psychology's coming of age in the Soviet Union.

The main characteristic of psychology as it has developed in the USSR is the scientific (materialistic) investigation of the highest forms of human psychic (mental) activity, of their evolution in the process of sociohistorical development, and of the fundamental laws of their operation. Consequently psychology in the USSR has always stood in a close relationship to the social sciences on the one hand, and to the physiology of higher nervous activity on the other, and has always been subject to the guidance of the philosophy of dialectical and historical materialism.

The most important task of psychology in the USSR has always been the investigation of the process of the development of the highest forms of psychic activity, in other words, their differentiation in the process of sociohistorical development. A decisive part in the performance of this task was played by the work of the prominent Soviet psychologist L. S. Vygotsky (1896-1934), who established the scientific analysis of the development of the highest mental processes.

Vygotsky's initial thesis, which has decisively influenced the further development of psychology in the USSR, was the realization that the highest mental processes in man are to be viewed as complex functional systems, which are sociohistorical in

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origin, mediated in structure (i.e., dependent on corresponding aids, e.g., language), and self-regulating as far as their mode of operations is concerned. A child always develops in the course of exchanges with adults. Even relations to things are mediated for the child by relations to adults. Through language acquisition, the child begins to organize its own behavior. The highest mental functious then arise; they are social in origin and dependent on a system of signs that comes into existence in the process of human intercourse, and--above all--on language.

In the further course of development, the child interiorizes slowly developed behaviors, i.e., they now depend not on external aids and on external, audible language but on inner language and the conceptual system formed in language. A process begins: i.e., the appropriation of universal human knowledge and of modes of behavior which have developed in history and have now become the major human behavior patterns. This approach to research has been extended by a great number of investigations carried out by Soviet psychologists and pre-eminently by A. N. Leontiev, A. V. Zaporozhec, P. J. Galperin and D. B. Elkonin, who have made a major contribution to the extension of the theory of the structure of human activity with its complex motives and needs, and auxiliary operations leading to the production of complex "inner behaviors". The investigation of different stages in the gradual development of "inner behaviors" proved to be very productive not only in regard to theory, but in regard to educational practice, and became the basis of a scientifically grounded transformation of educational methods put into effect in a number of Soviet schools. The psychological theory of the gradual development of intellectual activities and concepts is also at the basis of the principles of programmed learning as elaborated in Soviet psychology.

Another characteristic of psychology in the USSR is the constant search for the physiological mechanisms of complex psychic processes. This direction of research was established by I. M. Sechenov and realized in the investigations of I. P. Pavlov, A. A. Uchtomskii and V. M. Bekhterev, who developed the theory of the reflexive basis of psychic processes. In the last decades, a number of physiologists and psychologists have actively developed this field. P. K. Anokhin has established a theory of functional systems and of a behavior "acceptor", which play an active part in the regulation of complex behaviors. S. V. Kravkov elaborated

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a theory of the organization of sensory processes and their interaction. L. A. Orbeli grounded the theory of the interaction of afferent systems, was further developed by his pupils. In particular, by G. V. Gershuni, who worked out an unusually precise theory of the construction of sensory (and above all auditory) functions, and was the first to establish the scientific basis for an objective investigation of subsensory processes. An important part in the investigation of the reflexive basis of sensory processes was played by E. N. Sokolov's studies of the orienting reflex and those of complex forms of orientation and information-seeking behavior by A. V. Zaporozhec and co-workers.

Also important for the development of Soviet psychophysiology was the research work of B. M. Teplov and co-workers, who developed exact methods for the investigation of the main characteristics of nervous processes, and a concept for the objective study of types of human nervous activity and individual differences.

A new branch of neuropsychology developed by A. R. Luria and co-workers has also won considerable importance: it is concerned with the investigation of the changes in psychic processes occurring with local lesions of the brain.

Further important contributions to the development of psychology in the USSR have been made by e.g., P. A. Blonskii, S. L. Rubinstein, A. A. Smirnov and B. G. Ananiev.

Present-day psychology in the USSR is a complex and differentiated research system extending throughout general psychology (A. N. Leontiev, A. A. Smirnov, B. G. Ananiev, A. N. Sokolov, etc.), genetic and child psychology (A. V. Zaporozhec, L. I. Bozhovich, N. A. Mechinskaia, D. B. Elkonin), psychosomatic disorders (J. M. Soloviev, M. I. Zemcova, Z. S. Sif), medical psychology (B. V. Zeigarnik), psychophysiology (E. N. Sokolov, V. D. Nebylicyn), and engineering psychology (B. D. Lomov, V. D. Zinchenko).

The most important work in psychology is carried out in the Psychological Institute of the Academy of Educational Sciences in Moscow, and the Faculty of Psychology of the Universities of Moscow and Leningrad. Original work is also produced in Georgia--in the D. N. Uznadze Institute for Psychology of the Academy of Sciences of the Georgian SSR and by the Professors of Psychology at the University of Tiflis. Another important center is the Psychological Institute of the Ukranian Ministry of Education in Kiev.

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