General of the U.S. Public Health Service. I did not recommend the licensing of Sabin's type II vaccine, which fulfilled all the purely technical requirements, because of doubts about the effects of uncontrolled widespread use of type II on the efficacy of the type I strain. Since I have devoted as much committee effort on behalf of the live poliovirus vaccine as I have on behalf of the formalinized vaccine, I cannot take seriously an implied charge relating to the "inhumane" aspects of "withholding" a new vaccine. My article did not plead for inaction but for more considered action, which would make possible a continued attack on paralytic poliomyelitis. The existing evidence clearly indicates that the residual poliomyelitis problem in this country will be solved not by reimmunizing the adequately immunized, which is obviously going to be the major effect of mass programs sponsored by local medical societies, but by directing an equivalent effort to immunizing the nonimmunized. The particular vaccine used is a secondary issue, perhaps, but the energetic use of the formalinized vaccine would have made possible a better evaluation than will be possible with the now inevitable use of both vaccines. Edsall's experience with typhoid vaccine should convince him of the practical as well as the scientific importance of adequate evaluation of public health procedures.

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Inheritance in Soviet Medicine, Psychology, and Education

In a recent letter entitled "Soviet commitment to Lysenkoism" (*1*), Lincoln Pettit, discussing the influence of Lysenko on "other areas of knowledge" in the U.S.S.R., writes: "in the fields of education, psychology, and medicine, inheritance is ignored. Aptitude tests are unusable; deafness, mental disorders, and low intellectual capacity are attributed, respectively, to accidents, birth trauma, and laziness." This statement is so sweeping and so much at variance with my own information that a documented perusal of the topic would seem to be in order.

1) No mention at all is made of Lysenko or of inheritance of acquired characteristics in the closely documented and well illustrated 56-column ar-

ticle "Human inheritance" in volume 19 of the *Bol'shaya Meditsinskaya Entsiklopediya* (Large Medical Encyclopedia), published in 1961. Instead, we find in the article—in the midst of a thorough discussion of the main tenets and findings of classical genetics, including 30 references to the most recent American and Western publications—a listing, classification (by dominant, recessive, and sex-linked characters), and description of 87 inherited diseases. Deafness is one of the 87, and what is said about it is this: "Early total deafness leading to deafmutism is in the overwhelming majority of cases inherited autosomally and monorecessively. There are several different genes independently capable of producing deafness. Sex-linked deafness occurs more rarely. About half of the cases of deafness are inherited, the other half being caused by various external factors. The incidence of inherited deafness is about $2–3 \times 10^{-4}$. Late otosclerotic deafness is inherited dominantly" (*2*).

There is no entry for Lysenko in the *Entsiklopediya* (vol. 16, 1960), but there is an entry of two columns on Mendel (vol. 17, 1960), and there is one of a column and a half on T. H. Morgan (vol. 19, 1961).

2) Feeble-mindedness is defined in the 1958 *Uchebnik Psikhiatrii* (Textbook of Psychiatry) by Kerbikov *et al.* as follows (*3*): "By oligophrenia (feeblemindedness) we mean forms of underdeveloped mentality which are either innate or acquired in early childhood and which, while different in etiology and pathogenesis, are to a considerable extent similar in their clinical symptoms. Oligophrenia is a collective concept and not a uniform clinical unit." And current Soviet views on mental abilities are summarized by Leytes in 1960 as follows (*4*): "Abilities as such are not given to us ready-made at birth. Native capacity or talent is significant but is only one of the factors in the complex process of the development of abilities. . . . Characteristics of types of nervous systems are the innate basis of psychological differences among individuals." Needless to say, the two statements are a far cry from a view that in the U.S.S.R. "low intellectual capacity" is "attributed" merely to "laziness." (Note, however, that inadequate stimulation, particularly in early childhood, may well be *a* cause of mental retardation.)

3) Present-day Soviet psychology and psychiatry are, as is known, wholly Pavlovian in outlook. A basic tenet of the outlook is Pavlov's doctrine of con-

stitutional types of nervous systems as determined by innate strength, mobility, and balance of neural excitation and inhibition. In recent years, the "types" doctrine has been much extended by B. M. Teplov, the editor of *Voprosy Psikhologii,* and his many followers to include analysis of human personality structures—an extension and an analysis which, I venture, would, among other things, be much too hereditarian for the majority of our personality psychologists. Likewise, as might be suspected, the Russians make wide use of Pavlovian types of nervous systems in etiological psychopathology. There is absolutely no evidence that they "attribute" mental disorders to "birth trauma" (whatever Pettit means by it) more frequently than we do.

4) Not a single statement on the inheritance of acquired characteristics appears in the panoramic 2-volume, 1656-page, 39-article survey of current Soviet psychology, *Psikhologicheskaya Nauka v SSSR* (The Science of Psychology in the U.S.S.R.), published in 1959 and 1960 (*5*). Nor did the topic arise, formally or informally, in the recent 3-day Pavlovian Conference on Higher Nervous Activity (*6*), in which six prominent Soviet psychophysiologists and psychiatrists participated. There is only one short reference to behavioral experiments on inheritance of acquired characteristics in the long, informal, and very specific report on the state of current Soviet psychology made by three outstanding American psychologists who visited the U.S.S.R. in the summer of 1960—a largely negative reference: The Soviet experimenters told the American psychologists that so far no evidence of such inheritance was found (*7*). Likewise, I noted no significant Lysenkoist trends among psychologists and psychophysiologists in my visit last summer. Indeed, a number of Soviet scientists have written to me to express agreement with an article, "Pavlov and Lamarck" (*8*) in which I argued that Pavlov was not a Lamarckian. I have heard no disagreement.

5) Intelligence testing was discontinued in the Soviet Union in 1936, years before Lysenko's star had risen. It was discontinued, as is well known, in the wake of a resolution by the Central Committee of the U.S.S.R. Communist Party on "Pedological Inversions." The event was, by all tokens, a result of a complex of causes, involving largely such problems as putative interference with ideals of ethic and occupational equality, alleged dangers in creating I.Q. castes, validity of the tests, teacher responsibility, best ways of accelerating education, and the like. General views on heredity and environment were, to be sure, also operative, but really much more in relation to ease of modifying native endowment than to denials of its existence. To reduce it all to the simple formula that giving up intelligence testing leads to giving up the role of heredity in educability is quite fallacious, if for no other reason than that one may be a 100-percent Lysenkoist and believe that mental tests have much merit or be a 100-percent hereditarian and discredit them. Incidentally, it is my impression that there are signs that, in a modified form and a different framework, psychometrics may again become a part of Soviet psychology.

What has been said so far should suffice to demonstrate that whatever direct influence Lysenko may have on present-day Soviet genetics per se—and I am quite sure that Pettit greatly overestimates this influence (though space permits no documentation)—the indirect effects of Lysenkoism on present-

day Soviet medicine, psychology, and education are quite limited (*9*). The fact that there is no entry for Lysenko in the *Bol'shaya Meditsinskaya Entsiklopediya* while there are substantial entries for Mendel and Morgan, and the lack of any discussion of the inheritance of acquired characteristics in the encyclopedic *Psikhologicheskaya Nauka v SSSR*, are by themselves highly indicative. The role of inheritance is surely not ignored in present-day Soviet medicine, psychology, and education—indeed, the emphasis may well be comparable to what it is in the United States. The quoted statements on deafness, amentia, and mental abilities are hardly distinguishable from American homologs, while differences between Soviet and American psychiatry are not within the bounds of the heredity-environment problem. Not once have I come across, in recent Soviet educational and psychological writings, sharp criticisms of "sociologism"—overestimation of the role of environment in training and education—alongside criticism of "biologism"—the tendency to overestimate heredity.

Finally, it might be noted that, at least historically, environmentalism is by no means a Marxist-linked position. I know of no Soviet psychologist who would fully subscribe to the dictum of the late John B. Watson, founder of American behaviorism and long vice president of J. Walter Thompson and Company, that, given any healthy baby whatsoever and his (Watson's) own specified world to bring it up in, he could train it to become "doctor, lawyer, artist, merchant-chief and, yes, even beggar-man and thief, regardless of his talents, penchants, abilities, vocations, and race of his ancestors" (*10*).

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References and Notes

1. L. Pettit, *Science* **134**, 872 (1961).
2. *Bol'shaya Meditsinskaya Entsiklopediya* (Sovetsk, Entsiklopediya, Moscow, 1961), vol. 19, col. 1059.
3. O. B. Kerbikov, N. I. Ozeretsky, E. A. Popov, A. V. Snezhnevsky, *Uchebnik Psikhiatrii* (Textbook of Psychiatry) (Medgiz, Moscow, 1958), p. 315.
4. N. S. Leytes in *Psikhologicheskaya Nauka v SSSR*, B. G. Anan'yev, G. S. Kostyuk, A. N. Leont'yev, A. R. Luria, N. A. Menchinskaya, S. L. Rubinshteyn, A. A. Smirnov, B. M. Teplov, F. N. Shemyakin, Eds. (Akademiya Pedagogicheskii Nauk, Moscow, 1960), vol. 2, pp. 74, 87.
5. *Psikhologicheskaya Nauka v SSSR*, B. G. Anan'yev *et al.*, Eds. (Akademiya Pedagogicheskii Nauk, Moscow, 1959 and 1960).
6. *Ann. N.Y. Acad. Sci.* **92**, 813 (1961).
7. N. E. Miller, C. Pfaffman, H. Schlosberg, personal communication.
8. G. Razran, *Science* **128**, 758 (1958).
9. One finds, to be sure, a number of general

Lysenkoist statements in the literature of the three fields in the late 1940's and early and even middle 1950's. However, on the one hand, these statements seem to be rapidly disappearing from present-day writings, and on the other, there is no evidence that in the fields under discussion the statements were ever anything more than formal lip-service, without significant relation to concrete research and practice.

10. J. B. Watson, *Behaviorism* (Norton, New York, 1924).

Communication Satellites

The entirely reasonable point of view expressed in your news note "Space communications" [*Science* **133**, 1812 (1961)] elicited from a Bell System executive, J. R. Pierce, a quite misleading criticism [*Science* **134**, 527 (1961)].

It is misleading to say, as Pierce has on several occasions, that to stop to consider the issue of who should own and control communication satellites implies delay in achieving the technological triumph of an operative communication satellite system. Granted that speed is essential, it happens that public ownership of communication satellites is consistent with the earliest and most urgent use of such satellites—that for national defense. The Advent program (a synchronous, equatorial system) for the military is just such a project, built by private contractors for government ownership and control. Surely the less urgent civilian uses of communication satellites will not be delayed if a similar ultimate ownership and control situation is considered while the satellites are being perfected under private contract.

Pierce asks, "Must the very first satellite communication system connect us with all the underdeveloped countries, where internal communication itself is poor? How long should we wait to make sure that these will be included? Until the Russians have satellite communication first?" This is typical of the misleading arguments on this issue advanced by Pierce and his associates.

If the highest priority communication satellite system now under development in this country—*and also in the Soviet Union*—namely, the Advent system, proves operational, it will permit but not require interconnection between points in any countries of the world. This includes all the underdeveloped countries as well as the United States and countries in Western Europe where the transoceanic communication facilities are presently overburdened and inadequate. Unlike the low-altitude satellite system which Pierce favors,