Il rientro in scena di Lysenko (Allegato 1), che non è il primo da quando cominciò il suo declino all'indomani della morte di Stalin (Allegato 2), getta una luce preoccupante sulle possibilitàdi piena liberazione della scienza dal despotismo ideologico del partito, liberazione che è stata rivendicata recentemente da autorevolissimi scienziati come Kapitsa (Allegato 3) e Parin (Allegato 4), con le stesse argomentazioni e press'a poco con le stesse parole con cui era già stata rivendicata dieci anni fa (Allegato 4 bis).

La preoccupazione è giustificata dal carattere di certe prese di posizione del Comitato Centrale in tema di biologia applicata (Allegato 5) e dalla larga pubblicità data ufficialmente dalla stampa a recenti formulazioni teoriche di Lysenko (Allegato 6) e ad articoli relativi a sperimentazioni in atto sul controllo dell'ereditarietà (Allegato 7).

Ogni pretesa di esprimere giudizi netti sulla situazione che va maturando, sulle ragioni che ne costituiscono il presupposto e sui suoi possibili sbocchi, è manifestamente azzardata, anche perchè è stato tutt'altro che risolto, nel corso di questi anni,il problema della libertà intellettuale e della sua difesa dalla coazione dell'autorità (Allegato 8).

Una delle cause più rilevanti dell'attuale tendenza a stringere i freni e a ribadire la pressione despotica del partito sulla scienza è forse dovuta, come già avvenne in epoca staliniana (Allegato 9), alla temuta possibilità che, con la più ampia "apertura" sovietica verso occidente, connessa con la politica di coesistenza competitiva, penetrino nel paese idee eterodosse che il partito deve combattere per garantirsi il controllo totalitario della società.

Particolarmente viva è la preoccupazione di "infiltrazioni" culturali e intellettuali, estranee all'orizzonte dogmatico tradizionale in seno alla gioventù, anche a livello universitario. Tale preoccupazione rende sterile l'insegnamento, che deve essere svolto in forma innaturale, cioè non sollecitando i giovani a usare la propria

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testa, ma impedendo loro di pensare (Allegato I0).

Il principio della partiticità della cultura e della scienza, della necessità di ispirare l'una e l'altra allo spirito di partito, ripudiando l'obiettività scientifica "borghese", non fu un capriccio dello stalinismo, ma venne formulato apertamente da Lenin prima ancora della rivoluzione di ottobre e rilanciato più tardi come impegno programmatico (Allegato II): lo stalinismo, in realtà, non fece che portare alle loro logiche conseguenze le premesse leniniste (Allegato I2).

D'altra parte, la conferma della persistente tendenza, al di là dello stalinismo e della stessa destalinizzazione, a sottoporre l'attività scientifica al rigido condizionamento di apriorismi ideologici (Allegato I3), ci è offerta da quel celebrato documento ufficiale che è il nuovo programma del P.C.U.S., approvato dal XXII Congresso del partito alla fine dell'ottobre I96I.

Gli effetti del despotismo ideologico, che in pratica si traduce in interferenze amministrativo-burocratiche in campo scientifico, sono drammatici sempre, ma talvolta acquistano persino sapore pirandelliano (Allegato I4). Non manca poi chi, in quest'atmosfera di burocratizzazione scientifica, cerca di farsi emulo di Lysenko, sperando di far approvare da qualche organo di partito, come vere e ortodosse le sue "pensate" da piccolo avventuriero (Allegato I5).

Su un piano più generale, gli effetti più vistosi di questo orientamento ufficiale di sottomissione della ricerca scientifica agli interessi e fini di partito sono ovviamente quelli dell'isterilimento della capacità creativa dell'intelletto. Ne sono prova sia lo scarso numero di premi Nobel assegnati a scienziati sovietici in questo dopoguerra (Allegato I6), sia il contributo pressochè nullo dato dall'Unione Sovietica al progresso della ricerca pura, mentre spettacolari sono state, come nel caso degli Sputnick e dei missili, le affermazioni sovietiche nel campo della

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scienza applicata e della tecnologia.

In sostanza, si può dire che l'eccessivo timore per le idee nuove ha finito con l'inaridire una delle fonti più vive della cultura russa che in epoca pre-sovietica aveva dato un contributo decisivo al progresso scientifico, anche nel fondamentale settore della ricerca pura (Allegato IV).

Dott. Renato Panetta

14 Aprile 1964

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THE GUARDIAN

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N. 1

Mr K's novel theory of genetics

Lysenko school takes heart

By VICTOR ZORZA

Academician Trofim Lysenko, whose management of the genetics controversy bedevilled Russia's scientific life during the Stalin era, is again riding the crest of the wave.

The political support he received recently from Mr Khrushchev led to the condemnation yesterday of a book by a Soviet classical geneticist, Professor M. E. Lobashev, who had expressed the anti-Lysenko view.

The book review — a time-honoured Soviet method of conducting scientific-political controversies — appeared in the official journal "Agricultural Life," thus lending the weight of the Ministry of Agriculture to the reviewer's complaints.

He was surprised that the Ministry of Education should have recommended the book for publication. "One can imagine," he said, "how much harm is caused by it to biological science and the education of youth." The Mendelian genetics theory, espoused by the anti-Lysenko school, was "harmful, reactionary and metaphysical."

Lysenko's rôle

These arguments have the ring of the earlier battles. They revive memories of the purge which, under Lysenko's management, led to the dismissal, exile to Siberia, or imprisonment of hundreds of scientists. The dirty work was done by the police, not by Lysenko, but he has never been able to shake off his part in it.

His great attraction, both for Stalin and Khrushchev, lay in his promise to "train" farm animals and plants to produce greater yields by changing their environment, while the classical geneticists maintain that the character of species is determined by heredity, and that acquired characteristics cannot be transmitted by one generation to the next.

After the death of Stalin, Academician Lysenko was for a time in eclipse, but he has repeatedly bobbed up with ever new proposals to increase agricultural and live stock yields, much to Mr Khrushchev's delight, who has held him up as an example to other scientists.

Denunciation

Soviet scientific magazines have, as frequently denounced his pretensions and the harm he was continuing to do to Soviet science, sometimes describing him outright as a charlatan who had faked his experiments.

At the recent plenary session of the Communist Party's Central Committee some of the scientists again tried to dispute Lysenko's claims, but this had to be done circumspectly, by implication, since Mr Khrushchev was again on his side.

Mr Khrushchev himself brought it out into the open by describing the scientists' speeches as "a private and secret argument." By quoting dissimilar figures for agricultural yields, they sought to convey the substance of their argument without expressing it in so many words—thus revealing it only to the initiated, in much the same way as polemics between Mr Khrushchev and his political opponents are conducted.

One of Lysenko's latest claims is that if you have a big cow, of a breed that produces milk with a poor fat content, and a small bull, of a breed giving milk rich in fat—and if you mate the two—then you can fix whether the calf takes after the mother or the father by the food that you give to the mother. It is the cow's food, in his view, not the genetic factors, that is the most important for the future of the breed.

"It is possible," he claims, "to direct the development of the embryo, according to the experimenter's desire, either towards the paternal fat milk breed, or towards the maternal breed of low fat content — everything depends here on the intensiveness of the feeding of the cows."

No stifling

Discussing this in his Central Committee speech, Mr Khrushchev took to task the scientists who objected to this particular Lysenko method. He was not against arguments in science, he said, "they must not be stifled." But, he added in an aside about the anti-Lysenko school, "if we do not notice when barren scientists abuse real scientists who enrich science and practice, this will damage our common interests."

The anti-Lysenko scientists, it appears, objected to his new method because they had repeated his experiments, and found that their results did not match his claims. "But this," Mr Khrushchev told them, "was precisely because they were not approaching the problem in the same way as Comrade Lysenko."

It seems that if their experiments failed to confirm his claims, the fault was theirs, not Lysenko's—or, as Mr Khrushchev put it, "if others did not get any results, it does not mean that the theory is wrong."

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JOURNAL DE GENÈVE 9/8/1957 M.2

L'arme secrète de Nikita Khrouchtchev : la vache de 600 Kg

Le 17 juillet dernier, la « Pravda », de Moscou, publiait sur deux pages une interview de Trofim D. Lyssenko, le fameux biologue soviétique spécialisé dans les questions d'hérédité animale et de transmission des genes. Partisan de Staline qui lui accordait sa haute protection, Lyssenko avait été limogé en février 1954 par Khrouchtchev, après que l'application de certaines de ses théories eurent eu pour résultat qu'un million d'hectares de terre se furent révélés improductifs. Trofim D. Lyssenko avait eu, jusqu'alors la réputation d'être « le biologue libérateur des chaînes de l'Occident bourgeois ». Comme président de l'Académie de Lénine des sciences agraires, il était, en fait, dictateur incontesté de la biologie soviétique. Dans son interview à la « Pravda », il réclama du ministère de l'Agriculture qu'il porte son attention sur ses nouvelles expériences génétiques et les traduisent en faits.

Il vient d'être réhabilité par Khrouchtchev lui-même qui, après l'avoir condamné, il y a trois ans, lui rend à nouveau hommage et le proclame le plus grand des biologistes.

En se basant sur les expériences de Lyssenko, le secrétaire général du parti communiste avait adressé, il a dix semaines, on s'en souviendra, de Leningrad, un appel pathétique à tous les peuples de l'Union soviétique pour les inviter à prendre activement part à la « bataille de la viande et du lait ». « Si nous mobilisons l'intuition et le patriotisme soviétiques, s'était écrié Khrouchtchev, si nous parvenons à égaler la production des Etats-Unis en beurre, lait et viande par tête d'habitant, nous aurons tiré la plus puissante torpille qui se puisse imaginer contre les fondations du capitalisme.

Fourrage secret

Le secret de Trofim D. Lyssenko, qui est aussi celui de Khrouchtchev, est tombé dans le domaine public depuis que le dictateur soviétique a la biologie a levé lui-même un coin du voile et même le voile tout entier. Le biologiste russe s'est flatté, il y a peu de temps, d'être parvenu à élever une nouvelle race de bestiaux après des essais qui se sont prolongés durant plusieurs années. Son bétail, à dire vrai, paraît avoir des qualités réellement exceptionnelles. *Il mange moins, donne un lait plus crémeux et aussi plus de viande.* C'est donc tout bénéfice. C'est avec ces « vaches-miracles » que Khrouchtchev triomphe.

Lyssenko a révélé qu'il avait croisé de lourdes vaches de la race Kostroma avec des taureaux plus legers de la race Jersey. Pendant la période de prégnance il aurait réussi à exercer une influence sur les genes héréditaires de l'embryon en appliquant des méthodes d'affouragement spécifiques qui lui sont propres et sur lesquelles il a observé le plus grand secret. Le résultat aurait été tel que les veaux auraient hérité du peu de poids à la naissance et du plus grand contenu crémeux du lait des pères, ainsi que de la plus haute production de lait et du plus grand poids sur pied de la race maternelle. Trofim D. Lyssenko prétend que « ses » vaches qui ne pèseraient que trente kilos à la naissance, atteindraient, adultes, 600 kilos pour donner, bon an mal an, de 4000 à 6000 litres de lait contenant plus de 6 % de matières grasses sans avoir besoin pour cela de plus de dix-huit à vingt-huit unités fourragères.

C'est à cause de ces résultats — nous n'avons fait que traduire tant bien que mal le *Spiegel*, notre compétence étant nulle — que Khrouchtchev a soudainement décidé, impulsif comme on peut l'être, d'imposer les méthodes d'élevage de Lyssenko ressuscité aux sovkhoses des têtes à pieds fourchus. Dynamique à l'excès, le secrétaire général du parti communiste russe a fait calculer par ses spécialistes que, dès cette année, les vaches-miracles donneraient 54 % de plus de beurre, qu'elles donneront l'année prochaine 40% de plus de lait et qu'en 1960 ou 1961 elles donneront 216 % de plus de viande. A ce moment, le standard américain de la consommation aura été atteint. Est-ce bon ? Est-ce mauvais ? A ces questions, Khrouchtchev répond : Parce que les possibilités d'absorption alimentaire sont limitées chez les humains, que la corpulence favorise les maladies de cœur et encore parce qu'en Amérique la « ligne mince » continuera à être à la mode, c'est mauvais pour les Américains. Mais, pour nous Russes, c'est bon !

Les experts occidentaux sont sceptiques

On devait s'attendre à ce que les experts des questions agricoles occidentaux se penchent sur cet étonnant problème. Ils l'on fait. Ils sont sceptiques. Ils sont d'avis que les Soviets

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perdront la bataille du lait, du beurre et de la viande, comme ils perdront toutes les autres successivement. Les experts occidentaux pensent que les prétendus résultats obtenus par Trofim D. Lyssenko contredisent toutes les expériences faites jusqu'ici dans la génétique moderne. Le professeur John Loosli, de l'institut new-yorkais d'agriculture, a dit : « Le croisement d'une vache lourde et d'un taureau léger doit fatalement exercer un effet sur la grandeur et le poids du veau. En outre, il est certain que l'application de certaines méthodes d'affouragement pendant la prégnance de la mère ne saurait avoir d'effet sur les gènes du veau. »

Des experts occidentaux ont comparé le projet du biologue soviétique à l'élevage fictif de lapins par un certain Lasik Reitschwanz qui, dans un roman d'Ilja Ehrenburg, communiqua à la direction du parti la prolifération astronomique de ses deux lapins... alors que le couple était déjà mort depuis longtemps. Pourtant, c'est bien le même Ilja Ehrenburg, prince des poètes de Soviétie, qui a fêté Trofim D. Lyssenko en ces termes : « Nous changeons la nature et nous créons comme Dieu lui-même. » Incontestablement, la remarque peut être considérée comme blasphématoire. Mais, tout compte fait, si les Russes préfèrent conquérir le monde avec des vaches-miracles de 600 kilos qui mangent comme des veaux, plutôt qu'avec des bombes à hydrogène, on peut être d'accord.

Georges Blun.

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N.3

Kapitsa on the Need for Experimental Physicists

THEORY, EXPERIMENT, PRACTICE. (By Academician P. Kapitsa. Ekonomicheskaya gazeta, March 26, p. 10. Complete text:) The growing role played by science in communist construction demands an expansion of purposeful research that will open up new opportunities for the development of production forces, the broad and rapid application in practice of the latest scientific and technical achievements and a decisive advance in experimental work.

An advance in experimental work is, as the new Party Program states, one of the most urgent tasks of our science. For at present there is a disproportion in the development of experimental as opposed to theoretical work, and the tie between theory and practice is still weak.

I am speaking primarily of the physical and mathematical sciences. It is not difficult to see that our experimental physics lags behind our theoretical physics. Consider the works submitted in this year's Lenin Prize competition, for instance; among them there are many works on mathematics and theoretical physics, but there is not a single work on experimental physics. I am editor of the journal Eksperimentalnaya i teoreticheskaya fizika [Experimental and Theoretical Physics], and I can say that the majority of articles submitted to us are on theoretical physics—the ratio is approximately three or four to one. It is significant that young graduates of higher educational institutions want to go into theoretical rather than experimental work.

This lag in experimental physics cannot be tolerated, since it will greatly slow down the normal development of our physics and will prevent it from seizing leading positions in world science along the whole front of major investigations. The discrepancy between theory and experiment, between theory and practice is a symptom of a serious disturbance in the normal development of science. The fact that on the one hand our theoretical physics is divorced from life and that on the other hand the quality of experimental work is not high enough—all this disturbs the harmonious development of our science, and it seems to me that this applies not only to physics but to a number of other branches of natural science as well.

We must carry out such measures as are necessary to raise our theoretical physics to a new and higher level. To do this, of course, we must first ascertain the cause of the slow development of our experimental work and of the disturbance in the normal relations between the theoretical sciences and life.

The history of physics makes it clear that the division of physicists into theoreticians and experimenters is a very recent phenomenon. In the past not only Newton and Huygens but also such theoreticians as Maxwell usually provided their own experimental verifications of their theoretical conclusions and postulates. Now, however, it is only in exceptional cases that a theorist attempts to verify his own theories.

The reason for this is quite simple. Experimental techniques have become considerably more complex. They require great efforts, which are generally beyond the powers of a single man and are supplied by a collective of scientific workers. Indeed, such items of equipment as accelerators, liquefiers, complicated electronic systems, reactors, etc., usually require large staffs of scientific workers. Therefore the theoretical physicist cannot verify his own theoretical conclusions in practice; he must rely on the "charity" of the experimenters, must wait until they decide to verify his conclusions and proposals in practice.

Thus a disproportion arises between the number of theoretical studies and the possibility of subjecting them to experimental verification. A theoretician often publishes several works a year—let us say four—while the experimental verification of each of them ordinarily requires the efforts of several people—let us say five—over a period of a year or a year and a half. This means that 20 or 30 experimenters are needed for each theoretician. This is a schematic simplification, naturally, but it shows the general balance between theoreticians and experimenters required by the development of science.

At present the number of theoreticians and experimenters is approximately the same, and as a result the majority of theoretical conclusions fail to receive practical verification. Theory begins working for its own sake, and the value of its results is judged at best by methodological and esthetic considerations.

The harmonious development of science naturally demands that theoretical work not be divorced from experimental work, and this can be true only if theory rests upon a sufficiently large experimental base.

Why do so few people in our country go into experimental work, and why is it so inadequately organized? The answer is simple: In our time the work of the experimenter is more difficult and less "profitable," and this is so not only because in case of failure the experimenter will have lost twelve to eighteen months—i.e., the time that it ordinarily takes to complete an experiment—rather than two or three months, as in the case of the theoretician. The experimenter's work demands much greater efforts; not only must he understand theory but he must possess a number of practical skills in working with instruments, and it is also necessary to set up a well-knit collective. An experiment often requires days and nights of continuous work. As a result of all this, it takes considerably longer for experimental physicists to get scientific degrees than for theoretical physicists.

In order to submit a dissertation based on a work carried out collectively, he must single out the part that is supposedly his own personal contribution, and this must be confirmed by his chief. It isn't hard to see that this requirement is in basic contradiction to a healthy spirit in collective work, in which people must constantly exchange experience and ideas and must help one another and fill in for one another. The singling out of "personal property" for purposes of a dissertation runs against the nature of collective creativity and impedes its development. This turns many people, especially young ones, against experimental work.

The position of the leader of an experimental collective is also a difficult one. He is responsible for the work, but since he does not participate in many of its sections it is generally held that his name should not figure in the authors' collective. Young people underestimate the role of the leader, although it is he who recruits the collective, distributes the duties among its members and sifts the good ideas from the bad. Of course, the role of the leader is exceptionally great. In contemporary conditions the leader of a scientific project is like a theater director: He creates the performance, although he does not appear on the stage.

Nowadays it is sometimes very hard to attract gifted scientists into leading posts: heads of laboratories, directors of institutes. These positions are often filled by people who have administrative skills but lack creative scientific qualifications. This in turn leads to the lowering of the quality of scientific experiments I have already referred to.

Such important fields of modern experimental physics as cosmic research, the study of plasma and the nucleus, and the creation of accelerators call for very large scientific collectives, and the role of the leader is decisive. Only proper recruitment of leaders can ensure success.

There are other ways in which the position of the experimental physicist is sometimes inferior to that of the theoretician. For instance, if a theoretician receives a bonus, it is his alone, while if a bonus is awarded to a large collective of experimenters, each person's share may be quite small. All the tools the theoretician needs for his work are paper and pencil, and some can even dispense with these: When Euler became blind, he did his work in his mind.

But the experimenter requires good material facilities—premises with all kinds of special equipment, a large assortment of instruments, special materials, shops, a well-trained staff of laboratory technicians, etc. The speed and success of the work are conditioned by the quality of these material facilities. Ten years or so ago our material facilities were poor; now they have

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considerably improved, but their state is still such as to slow down the course of experimental work and to make it less attractive to scientists.

All this makes it easy to understand why young people try to get into theoretical work, and why there is an imbalance between theory and experiment. This in turn leads to a divorce of theory from life.

The work conditions of experimenters and directors and scientific work must be made at least as attractive as those of theoreticians. Our system of organization of scientific work must be further improved and its collective forms must be especially encouraged. Such measures of encouragement may rest on both material and moral factors. As examples I might mention the establishment of thematic prizes for experimental works, and the easing of conditions for awarding degrees on the basis of a single collective dissertation.

What I have said about physics applies to the other natural sciences as well. It is theory itself that suffers in the first place when theory is divorced from experiment and practice. I would like to illustrate this by reference to the work of philosophers who deal with the philosophical problems of the natural sciences.

There is a field of knowledge that bears the generally accepted name "cybernetics." Many people know what cybernetics is, and are also aware of the enormous role it plays in the life of contemporary society. But let us look at the definition of cybernetics that appears on p. 236 of the Philosophical Dictionary, published in 1954: "Cybernetics (derived from a Greek word meaning guiding, directing) is a reactionary pseudoscience that arose in the U.S.A. after the second world war and that spread widely in other capitalist countries as well; a form of contemporary mechanicism."

It is true that this is from a book published eight years ago. This mistake has been corrected. But after all, philosophers must anticipate the development of the natural sciences and not record a stage that has passed.

If, then, our scientists had listened to the philosophers in 1954 and had accepted this definition as a guide for the further development of this science, it can safely be said that the conquest of cosmic space, of which we are all legitimately proud and for which the entire world respects us, could not have taken place, because it is impossible to direct spaceships without cybernetic machines.

Here is another example showing the consequences of an insufficient understanding and knowledge of physical experiments. It is still fresh in many people's minds how a number of our philosophers, dogmatically applying the method of dialectics, demonstrated that the theory of relativity was without foundation. The philosophers directed their sharpest criticism at the theory's conclusion that energy is equivalent to mass multiplied by the square of the speed of light ($E = mc^2$). Physicists had long since verified this law of Einstein's through experiments with elementary particles; an understanding of these experiments required a profound knowledge of modern physics, which some philosophers lacked. And so the physicists carried out a number of nuclear reactions and verified Einstein's law not with individual atoms but on the scale of the atom bomb. It would have been a fine thing if the physicists had followed the conclusions of some philosophers and halted work on the problems of applying theory to nuclear physics! In what position would the physicists have placed the country had they not been prepared for the practical use of the achievements of nuclear physics?

These are especially vivid illustrations of the remoteness of some philosophers from practice, but there are many other examples, such as an incorrect evaluation of the indeterminacy principle of quantum theory, an incorrect evaluation of the theory of resonance in the study of chemical bonds, and others. It seems to me that our philosophers made such erroneous generalizations not only in physics but in biology as well.

This means that the application of dialectics to the natural sciences demands an exceptionally thorough knowledge of experimental facts and of their theoretical generalization. Without this, dialectics itself cannot provide a solution to the question. It is like a Stradivarius violin; these are the best violins there are, but to play one you have to be a musician and know music. Otherwise it will sound no better than an ordinary violin.

The work of the experimental scientists who made great contributions to the development of modern natural science, those whom V. I. Lenin called "spontaneous materialists," invariably proceeded in conditions of a close tie between theory and experiment. Therefore if the natural sciences are to develop on a healthy materialist foundation, each new theoretical generalization must necessarily be verified through experiment. The harmonious development of theory and practice is absolutely necessary for all the natural sciences.

As for the "mechanism" of the tie of theory and practice, I would like to illustrate it with an image presented long ago by Kelvin. He compared theory—he had mathematical theory primarily in mind, of course—with millstones and the experimental data with the grain that is poured between these millstones. The end product, flour, is used to advantage by people. It is perfectly obvious that millstones alone, no matter how much they may turn, can produce nothing useful—this would be theory working on its own. The quality of the flour is determined by the quality of the grain, and spoiled grain cannot yield nourishing flour. Therefore high-quality experimental work is necessary for constructing modern theory as well as for obtaining practical results.

High quality in experimental work is a necessary condition for the healthy development of science.

Central Committee on Leningrad Research Institutes

In Party Central Committee: ON LENINGRAD CITY PARTY COMMITTEE'S GUIDANCE OF PARTY ORGANIZATIONS AT RESEARCH INSTITUTES.* (Partiinaya zhizn, No. 8, April, pp. 31-35. Complete text.) The Party Central Committee has heard and discussed the Leningrad City Party Committee's report on the guidance of Party organizations at research institutes. The Party Central Committee has noted that the city Party committee, the borough Party committees and the primary Party organizations are doing considerable work in mobilizing the collectives of research and design institutions for the successful fulfillment of the Party and government directives on the development of science and on accelerating the rate of technical progress. In recent years scientists and specialists of Leningrad have made a big contribution to the working out of problems of the peaceful use of atomic energy and of the development of power engineering, electronics, automation and instrument making.

Questions of the work of research and design institutions are being discussed more and more frequently at aktiv meetings and at sessions of the city and borough Party committees and their bureaus. The practice of forming scientific and technical councils and commissions operating on public principles, in whose work scientists and specialists of research and educational institutions take active part, has become widespread in the guidance of Party organizations at research institutions. The Party organizations of many research institutes have begun to concern themselves more concretely with the content of scientific research and have intensified their control over the fulfillment of the subject plans. Ties between scientific institutions and production have grown stronger; the scale and volume of joint projects of scientific institutions and industrial enterprises in the conduct of research and the introduction of its results in production have expanded.

At the same time, the Party Central Committee has noted that major shortcomings occur in the Leningrad City Party Committee's guidance of Party organizations at research institutions. The work of many institutes and design bureaus still does not meet the demands with which the 22nd Party Congress confronted Soviet science and technology.

*[See Current Digest of the Soviet Press, Vol. XIV, No. 18, pp. 19-20.]

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The Current Digest
of the Soviet Press

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"Pavlov Assails Dogmatism of
Pavlov Cult in Physiology"

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MORE ON LYSENKO AND PAVLOV

Under the title 'Dogmas and Life', V. Dobrokhvalov published in *Literaturnaya Gazeta*, April 20, 1954, a letter to a friend (presumably fictitious) who had expressed disquiet about the way in which the followers of the agronomist Villiams had schematically extended the *travopolye* system of cultivation all over the country, without regard for local conditions. He was also disturbed that the Higher Diploma Commission, at two subsequent meetings, had reached clearly opposite conclusions about V. D. Dmitriev's doctoral thesis (cf. *Soviet Studies*, vol. VI, pp. 103 and 106).

Dobrokhvalov refuses to regard these two cases as merely incidental mistakes which occur in every kind of activity. He finds their root in the spread of dogmatism, which is the very opposite of creative science. Scientific creation is impossible without the feeling of dissatisfaction with existing achievements, without the urge to understand more deeply the reality surrounding us: where this urge dies down, self-sufficiency, ossification and dogmatism arise. Dogmatism appears in different forms, but in any case it divorces science from actual life and deprives it of its capacity to influence human practice. It grows on the basis of a neglect of the Marxist-Leninist principle of the unity of theory and practice. The dogmatic scientist forgets

that any valid theoretical conclusion concerns the manifestation of laws in *definite* conditions: neglect of these limitations led to the application of Villiams' *travopolye* system to the south of the USSR.

A second cause for the rise of dogmatism in science is an indifferent attitude to facts. Pavlov said that facts are for the scientist what the air is for the bird, Michurin experimented for twenty-eight years before he formulated his theory of the acclimatization of plants; but comrades like Dmitriev and some other biologists (examples are given) subordinate facts to pre-established theoretical schemes. 'Everyone of us,' Dobrokhvalov continues, 'knows the value of truly scientific authority. Through all its history science has had its leaders (*vozhaki*). The progressive importance of scientific authority rests upon its capacity to rally scientific forces, to encourage their appearance, not to retard their development. If, however, the authority represses scientific thought and claims a monopoly of possession of the truth, then it turns from a means of scientific progress into a brake upon it. Such a monopolist does not bear objections and criticism and is incapable of self-criticism: drunk with his fame he argues in the following way. "If you think otherwise than I do, then you are in error. I am a dialectician and materialist: if you think otherwise than I, this is evidence that you are a metaphysicist and mechanist." The monopolist does not imagine that he himself may occupy an incorrect position. All this promotes the growth of dogmatism and of the cult of personalities in the field of science.'

'In the scientific world there have always grown and will grow scientific schools, grouped around the most outstanding scientists. The existence of such schools and the broad exchange of arguments between them is the most natural state of science.[1] Unhappily, in our biology (and is it only biology?) scientific schools are not highly estimated.'

Some people believe that the struggle of opinions is legitimate only between tendencies which are opposite in their world outlook.[2] Yet Michurin invited his followers not to rest upon his teaching but to argue with it, thereby moving it forward; if necessary, to break obsolete tenets and to replace them by new ones which better correspond to the level achieved in scientific development. The struggle of opinions is fully legitimate and necessary between supporters of the one dialectical-materialist trend in science.

The 1948 session of the All-Union Academy of Agricultural Sciences, conducted under the leadership of the C.C. of the party, was very important for the development of our biology and agricultural science. It promoted the establishment of the Michurinist outlook and unmasked Weissmanism-Morganism as an anti-scientific tendency in biology. Yet in some research institutions, the struggle of opinions developed at that session was not followed up in the normal way. Of course, it was correct to remove the unmasked Weissmanist-Morganists from leading positions. But we cannot agree with describing as Weissmanists and stamping as ideological opponents

[1] This is precisely the point made by Academician Nemchinov in the Biology discussion of 1948 (*The Situation in Biological Science*, English ed. Moscow 1949, pp. 565ff), for making which, however, he had to face the need for resignation (ibid., p. 559).

[2] Cf. Zavadovsky, ibid., p. 345 and *Soviet Studies*, vol. I, pp. 117-18.

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the scientific workers who committed individual mistakes, for example accepted some statements of formal genetics, without serious consideration of the case (*razbora*). Some scientists were deprived of the possibilities of research work: of course, science cannot gain from such an approach (*postanovki dela*). Criticism in our research institutions is developed very weakly because of desire not to hurt a comrade, because of fear of falling into disgrace with authority, in short, because of absence of a principled approach, people frequently say the opposite of what they should say. This is the explanation of how the Dmitriev incident was possible. Dobrokhvalov quotes the letter of an old peasant woman who was deeply moved when she read in *Pravda* Stankov's letter (translated in *Soviet Studies*, vol. VI, pp. 105-6). Dogmatism is promoted by the presence in our research institutions of people who are mere hangers-on of science (*primazavchikhsya k nauke*): such people find their only salvation in dogmatism, and provide the main backing for the dogmatists. They are prepared to teach whatever is desired, provided only they are given the appropriate orders. Dogmatism is also carried by the opportunists who carefully watch which way the wind is blowing, and are prepared to defend alternative dogmas when this is more profitable. Dobrokhvalov concludes with a criticism of the philosophers who have joined the biologists in their struggle against the Weissmanist-Morganists but failed to start it, who have supported the incorrect generalization of the *travopolye* system and also Lysenko's new views on species and their formation, without, however, participating in the discussion when these views proved to be controversial. Also the writers (including an article by Gennady Fish which advertised Dmitriev's view) have made their contribution to the popularization of the views of the authorities, and thereby strengthened dogmatism. The most important thing, Dobrokhvalov concludes, is to think critically, and thereby to move our science forward.

In connection with Dobrokhvalov's articles, attention may be drawn to an article by I. Kochergin, Chairman of the Learned Council of the Ministry of Health of the USSR, and A. Bakulev, President of the Academy of Medical Sciences, entitled 'For Creative Development of Pavlov's Physiological Teaching' which was published in *Meditsinsky Rabotnik* (the newspaper of the Ministry of Health) on May 21, 1954. Referring back to the Pavlov session of 1950[3] it is stated that a number of outstanding physiologists – L. A. Orbeli, I. S. Beritashvili, P. K. Anokhin and A. D. Speransky – committed individual methodological mistakes. Their merits as well as their mistakes (the latter in a tactful and friendly way) are again enumerated; readers are warned against a possible misunderstanding of some articles published in *Meditsinsky Rabotnik* in the sense of a revision of the decisions of the Pavlov session. The main tenets of Pavlovian teaching are reiterated and the orthodox Pavlovists, apart from recognition of their various merits, get friendly criticism for failure sufficiently to apply these teachings to medical science; Ivanov-Smolensky, however, is criticized for 'unfounded reactions' (*otpor*) against criticisms of his methods. As from Dobrokhvalov's article, one gets the general impression that the basic attitude arrived at in the 1948-50

[3] Reviewed ibid., vol. III, pp. 34ff.

discussions is taken for granted but that the merits of those who were defeated in those discussions are now appreciated and the predominant school is warned against dogmatism and repressive measures: the latter element is in biology more evident than in physiology where, in the absence of a personality such as Lysenko and his methods of denouncing critics and making demagogic appeals to the agricultural interest, relations during the last years appear to have been more happy.

R. S.

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FEATURES

Party and Government Resolution on Applied Biology

In the Party Central Committee and the U.S.S.R. Council of Ministers: ON MEASURES FOR FURTHER DEVELOPING BIOLOGICAL SCIENCE AND STRENGTHENING ITS TIES WITH PRACTICE. (Pravda, Jan. 25, p. 1; Izvestia, Jan. 26, pp. 1-2. Complete text:) The Party Central Committee and the U.S.S.R. Council of Ministers have adopted a resolution "On Measures for Further Developing Biological Science and Strengthening Its Ties With Practice."

The Party Central Committee and the U.S.S.R. Council of Ministers note that Soviet science has scored important successes in the area of general biology, in further elaborating the theory of the development of the organic world, and on this basis has achieved significant results of great practical importance for agriculture, medicine and various branches of industry.

Soviet biologists of the Michurinist school have made great strides, and they lead the world in the field of genetics, selection and seed growing, especially in questions of control of heredity and its variability; they have made fundamental contributions to the theory and practice of agricultural production. On this basis Soviet scientists have devised and are putting to practical use in agriculture a number of new seed-selection and agrotechnical methods—the changing of spring varieties into winter ones and of winter varieties into spring ones through directed alterations in heredity, the intravariety crossing of self-pollinating plants, the free interpollination of varieties, and vegetative and remote hybridization. Utilizing these and other techniques, our country's selectionists have developed and introduced in collective and state farm production new high-yielding varieties of wheat, corn, sunflowers, sugar beets and other crops.

Successes have been achieved in the development of highly productive new breeds and breed groups of cattle, pigs and sheep. The Lenin Hills Experimental Base of the U.S.S.R. Academy of Sciences' Genetics Institute has developed a herd of pedigree cows whose milk has a butterfat content of 5% to 5.2%; this herd can be used for significantly raising the butterfat content of the milk from collective and state farm herds.

The theoretical and practical work in the field of root nutrition of plants and the methods that are being devised for more efficient use of mineral and organic fertilizers are of great importance for the further development of agriculture and of a rational system of crop farming.

Such divisions of science as biochemistry, biophysics, genetics, microbiology, virology and immunology, which are concerned with the detailed study of the structure and functions of living matter at all stages of its development, are assuming ever greater importance.

On the basis of the work done by biochemists, microbiologists and chemists, the U.S.S.R. has built up its own industry for the production of antibiotics and vitamins, which have found widespread application in medicine and agriculture. Through the use of genetic methods, highly active culture media for antibiotics have been obtained and put to use in production. This has made for a significant increase in the output of penicillin, streptomycin, terramycin and other antibiotics. Methods have been devised for the production of a variety of defoliants, desiccants and other inhibitors and stimulators of plant and animal growth. Highly effective techniques have been worked out and are being introduced in practice for using mineral fertilizers, in particular fertilizers containing microelements (manganese, molybdenum, copper, boron and zinc). Conditions have been provided for expanding the industrial production of ferments, which are very important in medicine and a number of branches of light industry and the food and chemical industries.

Substantial successes in the field of medical science and the application of the theory of I. P. Pavlov, which has played an important part in the elaboration of the physiology of living organisms, have made possible the solution of a number of problems in applied medicine. Research on immunity, the endemic nature of transmissible* diseases and helminthology has been greatly expanded, which has made possible substantial reduction of the incidence of many dangerous diseases of man and animals. Methods have been devised for restoring the vital functions of the organism of a person in a state of shock and clinical death. Use of hypothermia has made possible effective surgical operations on the heart, lungs and blood vessels.

Successes in the field of virology have made possible the development of new and improved means of combating dangerous virus diseases. Substantial gains have been scored in the control of poliomyelitis. The employment of vaccines, serums, antimicrobic drugs and other chemical preparations has led to the virtual elimination of a number of infectious diseases in the Soviet Union.

The work of Soviet biologists helped bring about man's first flights into space.

At the same time, the Party Central Committee and the U.S.S.R. Council of Ministers note that research has not expanded sufficiently in several branches of biology and allied sciences, as well as in those branches of chemistry and physics concerned with agriculture and medicine. In a number of cases the research is being conducted on a low level and is theoretically fruitless and of no practical importance. In spite of this, the press has been carrying more and more articles of late unjustifiably publicizing and showering praise on the supposed accomplishments of these projects, which creates an atmosphere of unhealthy sensationalism and misguides public opinion.

Entirely too few research institutions and scientists, particularly in the biology divisions of the U.S.S.R. Academy of Sciences and the Union-republic Academies of Sciences, are working on problems in the theoretical biology of the Michurinist school. The training of scientific cadres capable of applying these theoretical principles of biology has been unsatisfactory.

The chemistry and physics of living matter are being studied insufficiently. There is a serious lag in research concerned with the synthesis of herbicides, chemical poisons and other chemical means of plant protection. Little research is being done in the fields of agrochemistry, soil science and plant physiology. A feeble effort is being made to solve problems related to the synthesis of new types of concentrated and mixed fertilizers. There are serious lags in the scientific working out of questions of the fodder base and the use of chemicals in animal husbandry.

With a view to the continued progress of biological science and to strengthening its ties with practice, the Party Central Committee and the U.S.S.R. Council of Ministers judge it essential that everything possible be done to develop the entire complex of biological sciences. The principal tasks of these sciences shall be to elucidate the nature of the phenomena of life, to ascertain the biological laws governing the development of the organic world, to study the physics and chemistry of living matter and to evolve various methods of controlling vital processes, in particular metabolism, heredity and the directional changing of organisms. The Michurinist school, which starts from the assumption that the conditions of life are the key factor in the development of the organic world, must be more widely and thoroughly developed in biological science. Medical science must concentrate on discovering means of preventing and conquering cancer, virus and cardiovascular diseases and other high-mortality diseases. Theoretical principles and practical measures must be worked out for increasing human longevity and man's capacity for work. Growing importance attaches to the study and extensive use of microorganisms in the national economy and in

* [The term is limited in Russian usage to insect- and arachnid-borne diseases.—Trans.]

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public health work, among other things for the production of foods and feeds, vitamins, antibiotics and ferments and for the development of new agrotechnical and zootechnical methods.

The Party Central Committee and the U.S.S.R. Council of Ministers have laid down as the basic problems to be solved by biological science in the interest of advancing agriculture, medicine, light industry and the food industry:

—control of the processes of species formation and of the heredity and viability of plants, animals and microorganisms with the object of evolving effective new methods for the selection of agricultural plants and animals;

—metabolism and energy exchange in organisms determining the growth and development of plants and animals, and ways of controlling the metabolic process;

—the physical properties, chemical structure and physiological functions of proteins, nucleic acids and other biologically important compounds, and elucidation of the nature of immunity as a basis for developing new methods for the treatment and prevention of diseases of man, animals and plants;

—the study of photosynthesis, chemosynthesis, the biological fixation of nitrogen and root nutrition of plants, the devising of methods for heightening the degree of utilization by plants of solar energy and soil nutrients and for enriching the soil with nitrogen, the development of new and more effective types of fertilizers and of methods for applying them;

—the nature of the action of herbicides, defoliants and other biologically active substances and the synthesis of new ones with a view to their utilization in crop cultivation;

—the development of new preparations to be used as drugs in medicine and as means of controlling plant and animal diseases and pests in agriculture;

—the structure and functions of the cell; the physiology and biochemistry of the degeneration of the normal into the malignant cell; the laws governing the interaction of viruses with the cells of plants, animals and microorganisms;

—the structure and activity of the central nervous system and other physiological systems in man and animals;

—the basis of the biological effect of nuclear radiation, the use of small doses of radiation in crop cultivation and animal husbandry, the development of methods of preventing radiation damage;

—the origin and development of life and the possibility of its existence in outer space;

—the scientific principles underlying the conservation and replenishment of natural resources and the storage and processing of animal and vegetable raw materials, including canning and ensiling;

—the development of selection methods for corn, grain, leguminous, industrial, oil-bearing, vegetable, fruit and other crops, and in particular winter wheat, for frost-resistance, winter hardiness and resistance to diseases and pests;

—the expansion of work on the hybridization of plants and animals with a view to the practical utilization of higher-yielding hybrids of the first generation;

—the working out of technologies for the production of fodder vitamins and antibiotics for animal husbandry, of methods for the enrichment of feeds with microbial proteins, and of the technology for the industrial production of fodder amino acids;

—the working out of farm animal fodder rations for the various zones of the country and of effective ways for improving them with mineral additives, vitamins and growth stimulators and by the use of synthetic urea, as well as the investigation of other chemical preparations that help increase the utilization of proteins and other important nutrients contained in fodders, with the object of raising the productivity of animal husbandry;

—the devising of biological methods of combating animal parasites and plant pests in agriculture;

—the working out of methods for the prevention of early diagnosis of virus diseases and of measures for combating them in animal husbandry and crop cultivation, as well as the investigation of the laws governing the distribution and development of causative agents and vectors of diseases and the working out of effective ways to eliminate them.

Taking into account that the biological sciences are called upon to facilitate the creation of an abundance of high-quality food for the people and raw materials for industry and the organization of new biochemical industries in the interests of medicine, agriculture, the food industry and light industry, the Party Central Committee and the U.S.S.R. Council of Ministers consider it essential:

—to strengthen in every way the ties between biological research institutions and production;

—to make comprehensive use of the achievements of biology for the national economy and medicine;

—to intensify the collaboration between biology and other branches of natural science—physics, chemistry and mathematics;

—to make more extensive use of the achievements of present-day technology for research on living matter;

—to improve the system of training cadres capable of carrying out highly skilled research on problems in biology.

With the object of integrating the efforts of Soviet scientists directed toward solution of the most important tasks in the biological, agricultural and medical sciences, it has been deemed essential to improve the ties between the research institutions of the U.S.S.R. Academy of Sciences, the Union-republic Academies of Sciences, the U.S.S.R. Ministry of Agriculture, the V. I. Lenin All-Union Academy of Agricultural Sciences, the U.S.S.R. Ministry of Public Health, the U.S.S.R. Academy of Medical Sciences and higher educational institutions.

The U.S.S.R. Academy of Sciences, the U.S.S.R. Ministry of Agriculture and V. I. Lenin All-Union Academy of Agricultural Sciences, the U.S.S.R. Ministry of Public Health and U.S.S.R. Academy of Medical Sciences, and the U.S.S.R. Ministry of Higher and Specialized Secondary Education have been instructed to coordinate the plans for research on the most important problems in biology, promote in every way the Michurinist school in biological science, and greatly expand research in the fields of chemistry that serve agriculture and medicine and in biochemistry, biophysics, virology, microbiology and physiology.

The biological research institutions of the U.S.S.R. Academy of Sciences, the Union-republic Academies of Sciences and the universities should concentrate primarily on investigating the basic biological laws governing the development of organisms and on elaborating long-range problems in the physics and chemistry of living matter.

The research institutions of the U.S.S.R. Ministry of Agriculture, the Union-republic Ministries of Agriculture and the higher agricultural schools should concentrate primarily on evolving methods for the directed development of highly productive plant varieties and livestock strains, on developing intensive systems of farming and on the chemicalization of agriculture.

The research institutions of the U.S.S.R. Ministry of Public Health, the U.S.S.R. Academy of Medical Sciences and the Union-republic Ministries of Public Health, as well as the higher medical schools, should concentrate primarily on working out theoretical principles and practical methods for the prevention and cure of diseases.

The U.S.S.R. Council of Ministers' State Committee for Coordinating Scientific Research, the U.S.S.R. Council of the National Economy, the U.S.S.R. Ministry of Agriculture, the U.S.S.R. Ministry of Public Health and the U.S.S.R. Council of Ministers' State Chemistry Committee should take measures aimed at the earliest practical application of the results of research.

The U.S.S.R. Academy of Sciences, the Union-republic Academies of Sciences, the U.S.S.R. Ministry of Agriculture and V. I. Lenin All-Union Academy of Agricultural Sciences, the U.S.S.R. Ministry of Public Health and U.S.S.R. Academy of Medical Sciences, and the U.S.S.R. Ministry of Higher and Specialized Secondary Education have been requested to tighten their supervision of biological research institutions with a view to securing greater results from research projects, and to focus the main efforts of these institutions on key scientific problems whose solution will facilitate the accomplishment of practical tasks in agriculture, public health and the further development of the food industry.

The U.S.S.R. Ministry of Higher and Specialized Secondary Education, the U.S.S.R. Ministry of Agriculture and the U.S.S.R. Ministry of Public Health have been instructed to make a survey within three months' time of the curriculums and

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syllabuses for the biology specialties in the universities and agricultural, medical, pedagogical and other higher educational institutions with the aim of bringing about improvements in the teaching of genetics, physiology, biochemistry, biophysics, cytology, microbiology, virology and agricultural chemistry; to ensure the production within two years' time of textbooks in genetics, physiology, biochemistry, biophysics, cytology, microbiology, virology and other branches of biology that are abreast of the present levels of those sciences. Instructions have been given to announce competitions for such textbooks, establishing appropriate prizes.

The U.S.S.R. Ministry of Higher and Specialized Secondary Education and the U.S.S.R. Ministry of Public Health must organize departments of biophysics and biochemistry and specialized chairs of cytology and virology under the biology faculties of a number of universities and in some medical institutes, as well as establish departments (chairs) of biophysics under physics faculties, and departments (chairs) of the chemistry of natural compounds under chemistry faculties.

In 1963 the Union-republic Councils of Ministers, in agreement with the U.S.S.R. Ministry of Higher and Specialized Secondary Education, are to set up laboratories for research in problems of Michurinist biology, biochemistry, biophysics, cytology, microbiology and virology attached to major chairs at higher educational institutions, and to this end are to make provision for increasing the number of scientists and technicians and appropriations for the equipping and maintenance of these laboratories.

The U.S.S.R. Ministry of Agriculture has been authorized to set up departments of agricultural biology in a number of branch and zonal agricultural institutes.

The U.S.S.R. Council of the National Economy has been instructed, jointly with the U.S.S.R. Ministry of Higher and Specialized Secondary Education, the U.S.S.R. Ministry of Agriculture, the U.S.S.R. Ministry of Public Health, the U.S.S.R. Academy of Sciences and the Union-republic Councils of Ministers:

—within three months' time to work out plans for 1963-1965 for the enrollment of students in the specialties of genetics, physiology, biophysics, biochemistry, cytology, microbiology, virology and agricultural chemistry, with the object of meeting the needs of research institutions, higher schools and production organizations for cadres in the specialties indicated;

—within two months' time to work out and approve according to the established procedure a plan for 1963-1965 for the enrollment of graduate students in genetics, biochemistry, biophysics, cytology, microbiology and virology to meet the needs of research and higher educational institutions for skilled scientific cadres.

The U.S.S.R. Ministry of Higher and Specialized Secondary Education has been authorized to institute, starting in 1963, one- and two-month advanced training courses in Michurinist biology, biochemistry, biophysics, cytology, microbiology and virology for teachers in higher educational institutions.

The U.S.S.R. Council of Ministers' State Committee for Coordinating Scientific Research, the U.S.S.R. Council of the National Economy, the U.S.S.R. Ministry of Agriculture, the U.S.S.R. Ministry of Public Health, the U.S.S.R. Council of Ministers' State Atomic Energy Committee, the U.S.S.R. Council of Ministers' State Chemistry Committee and the U.S.S.R. Academy of Sciences have been instructed within three months to draw up and submit to the U.S.S.R. Council of Ministers for consideration proposals for the expansion of experimental-design work on and the production of up-to-date instruments, apparatus and laboratory equipment for the needs of scientific research in the field of biology and for the small-scale mechanization of experimental work in agriculture, as well as for a substantial expansion of the range of chemicals, biochemical preparations and radioactive tracer compounds being produced.

The State Medical Publishing House, the State Agricultural Publishing House and the U.S.S.R. Academy of Sciences Publishing House have been requested, as of 1963, to increase the publication of monographs and surveys on current problems in general biology, genetics, biochemistry, biophysics, virology, microbiology, physiology and agricultural chemistry. The Foreign Literature Publishing House and other publishing houses are to increase the publication of translations of textbooks, monographs and surveys in the enumerated branches of science.

The 20th Anniversary of 'The Battle on the Volga'

20th Anniversary of the Battle on the Volga: IN THE DAYS OF THE HEROIC EPIC. (By Marshal of the Soviet Union A. Yeremenko. Pravda, Jan. 27, p. 3. Complete text:) In the history of war there have been no battles equal to the battle on the Volga, either in scale or in historic consequences. For six and a half months violent fighting raged, without slackening a moment, in the Volga-Don interfluve, at the walls of the hero-city, in its streets and squares, in workers' settlements and at the Volga wharves. The invaluable qualities of love of country, courage, selflessness, hatred for the enemy and an unconquerable will to victory, which had been instilled in the Soviet fighting man by the Communist Party, attained truly epic proportions during this battle.

It is difficult to describe in a few words a battle that continued without interruption for 200 days and nights, and it is especially difficult for one who had occasion to live through it alongside the troops. It was our great good fortune that Nikita Sergeyevich Khrushchev was a member of the Military Council of our front at this most crucial period and was in the thick of the troops that first defended Volgograd and then went on to inflict a shattering blow on the enemy.

I shall mention some facts and figures that indicate the range and the bitterness of the Volga epic. At several stages of this battle, which enveloped an area of almost 100,000 square kilometers and was waged along a front extending from 400 to 850 km., more than two million men, tens of thousands of guns and mortars and thousands of tanks and planes took part in the fighting. The defenders of the hero-city beat off many hundreds of furious attacks and themselves carried out almost as many counterstrikes and counterattacks.

The situation before the beginning of the battle on the Volga was unfavorable for our troops. In the spring of 1942 the enemy, despite the heavy losses suffered on the approaches to Moscow, managed to achieve considerable successes in the Crimea and near Kharkov, as a result of which the balance of forces changed in his favor. In the summer the fascist hordes poured in a broad stream into the plains of southern Russia and the Ukraine and then reached the passes of the Greater Caucasus. Once again success attended Hitler and his generals. At the time Stalin attributed this success to the absence of a second front in Europe. Undoubtedly a blow from the allies in the West would have eased the struggle on the Soviet-German front. Nevertheless, the major mistakes made by Stalin himself in evaluating the situation and in strategic planning and the direction of the troops played a large role in the unfavorable development of the situation for us. Stalin recognized the possibility of a Wehrmacht attack in the south, but he believed that the enemy's main blow would be struck against the flank of the central grouping of the Soviet Army with the object of seizing Moscow, although intelligence had given good warning that the enemy's actual intentions were to attack in the Volga area and the Caucasus. Stalin, overrating the success of our winter offensive, failed to take into account the fact that the fascist army had been able to recoup after the defeat it had suffered and had regained its offensive potential.

In the light of historical truth, the legend of Stalin's supposedly decisive role in planning and directing operations in the Volgograd area must also be dispelled. His part was vastly exaggerated at the time, and besides, several of his principal decisions were erroneous. Thus at the beginning

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Lysenko Restates and Elaborates Heredity Theory

THE THEORETICAL PRINCIPLES OF DIRECTED CHANGE OF HEREDITY IN AGRICULTURAL PLANTS.* (By Academician T. D. Lysenko. Pravda and Izvestia, Jan. 29, pp. 3-4. Complete text:) This conference on the question of guiding the heredity of plants is of great interest for agricultural practice and biological theory. More than 70 reports have been heard. Many of them have proved that in different regions spring cereals having absolutely no frost-resistance change in the course of two or three years (generations), under the influence of autumnal conditions, into hereditary winter cereals with good hardiness. On the other hand, winter varieties change to spring ones under the influence of vernal conditions.

Such experiments, in which profound theoretical questions are solved through the accomplishment of important practical tasks, have exceptional significance for the development of an effective science of biology. In these experiments practice not only serves as a criterion of the correctness of theoretical premises but is also the chief means of discovering and learning the biological laws of the life and development of the organic world.

Who, after hearing the reports delivered at this conference, can now seriously doubt the possibility of forming in the full sense of the word, of creating, good winter cereals from plants having absolutely no winter hardiness—for instance spring wheat or barley—by means of the conditions of the nonliving environment? If desired, only a part of the hereditary properties of a non-frost-resistant spring variety need be changed; it can be given a hereditary winter hardiness, leaving the remaining hereditary properties practically untouched. It is also possible to change many other hereditary properties—for instance, to replace small ears by larger ones, or to improve the quality of the grain. If desired, certain biological species can be changed into others; for instance, 28-chromosome hard wheat, or Triticum durum, can be changed into 42-chromosome soft wheat, or Triticum vulgare.

We can already boldly assert that our science has mastered the question of directing changes in heredity, and no matter how the methods of influencing plant organisms may change, priority in this important theoretical discovery of biological science belongs to the Soviet Union, to Michurinist biology.

Tens, hundreds and thousands of scientific workers, specialists and leading collective and state farm workers in our country have been and are engaged in the solution of important questions of biological theory. Herein lies the scientific strength of our Soviet, Michurinist biology. It is being developed by large numbers of people. The Communist Party of the Soviet Union and its Leninist Central Committee have created all the material and moral conditions necessary to make science broadly accessible to the working people. In our conditions, arguments and discussions on profound theoretical questions of biology are settled in the final analysis by practical workers. Only that theory is victorious which produces methods of easing labor, of raising its productivity.

The majority of the speakers at this conference are engaged in plant selection. Their practical work consists in creating good varieties of cereals and other crops. It is obvious that in creating varieties it is necessary to make use of the various methods already existing and also constantly to develop new ones. Our well-known selectionists V. S. Pustovoit, P. P. Lukyanenko, F. G. Kirichenko, V. P. Kuzmin and others have created and are creating good varieties because, knowing the demands of practice, they have in theory long since recognised the role and importance of the conditions of life, of the environment, in the creation of plant forms.

Most of the reports specially chosen for this conference have been devoted to the question of the transformation of non-winter-hardy forms of spring cereals into hardy winter forms. The reason for this was to show by important practical work the effectiveness of the fundamental materialistic theory of biology asserting that the conditions of life are the prime factor in the development of the organic world. The statements at this conference have shown that, proceeding from this theory, hundreds of people, chiefly young selectionists, have already learned to a greater or lesser degree the methods of transforming non-winter-hardy cereals into good winter ones.

For the first time in the history of agriculture, relatively frost-resistant varieties of hard winter wheat have been developed for the steppe areas of the Ukraine and the Northern Caucasus. This was begun by F. G. Kirichenko when he created the winter-wheat strain called Michurinka. Now he has many other varieties that are even better. At the same Odessa Selection and Genetics Institute, V. F. Khitrinsky and D. A. Dolgushin have obtained forms of hard winter wheat by changing the nature of non-winter-hardy spring wheat. Hard winter wheats have also been obtained by B. Z. Sergeyev in Rostov and by other comrades in various parts of the Soviet Union.

What is the explanation of the fact that previously neither practical workers nor scientific selectionists were able to produce hard winter wheats for these areas? For many such attempts were made. I will mention only the extensive work done, a long time ago now, at the Bezenchuk station on crossing hard spring wheats with soft winter wheats in order to obtain a hard winter variety. Attempts to create hard winter wheats were also made at a number of other places, but they did not yield positive results. This can be explained by the fact that there was no biological theory correctly describing the role and importance of environmental conditions in the origin and life of organic forms. Herein lay the reason for the failure to solve this and many other analogous problems in plant selection.

When V. N. Remeslo began work at the Mironovo Selection Station, he quickly and brilliantly worked out a method for obtaining good winter varieties from non-winter-hardy spring wheats. From the hard spring wheat Narodnaya he obtained the good soft winter wheat Mironovskaya-264. The quality of this variety and of V. N. Remeslo's work can be judged from the following fact: It was only in 1957 that he turned this variety over to the State Variety-Testing Service to be appraised and tested, yet by the autumn of 1962 more than 1,000,000 hectares of collective and state farm fields had been sown to the new variety for the 1963 harvest. By the same method he developed a still better winter variety—Mironovskaya-808—from the Artemovka spring wheat; it proved to be higher yielding and more frost-resistant than any other variety of winter wheat now sown in the Ukraine and the Northern Caucasus. V. N. Remeslo turned his new variety over to the State Variety-Testing Service in 1960, and by 1962 an area of approximately 20,000 hectares had been sown to it for the 1963 harvest. There can be no doubt that in two or three years' time this wheat will occupy millions of hectares.

V. N. Remeslo still has in reserve other good new varieties of winter wheat obtained from spring wheat. I believe that other selectionists who are working with winter crops in other areas will also achieve great successes in developing better and better varieties in the next few years.

It is heartening that selectionists have begun to develop good varieties of spring wheat from large-eared winter varieties; these have valuable properties for Siberian areas. This was reported by S. T. Bogomyakov, a worker of the Altai Agricultural Institute in Barnaul, and also by G. P. Vysokos, a worker of the Siberian Agriculture Institute in Omsk. They have already turned a number of winter wheats into good spring ones. Comrade Vysokos has changed the high-yielding Bezostaya-1 winter wheat into a spring wheat. I am sure that by using this method, selectionists of Western Siberia and the Kazakh Republic's Virgin Land Territory will be able in

* Report delivered on Dec. 3, 1962, to a scientific conference on questions of guiding the heredity of agricultural plants, convened by the V. I. Lenin All-Union Academy of Agricultural Sciences.

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the next few years to produce a number of good early-ripening varieties of spring wheat.

A. S. Musiiko has reported to this conference on the successful development of good corn varieties and hybrids. Also interesting and of importance to science are the reports made by many other speakers on changing the nature of various plants in various areas of our country.

A few words about cotton. The information given by S. S. Sadykov, I. K. Maksimenko and others on work with this plant was both interesting and important. But with this plant, as with other heat-loving plants, we have not yet found simple methods of changing its nature quickly and surely in the direction desired by practical workers. Yet the biological laws discovered by our science are common to all plants, animals and microorganisms. Selectionists must know these laws and learn to utilize them in solving practical questions. On the basis of the biological laws that have already been discovered, it is necessary to work out, proceeding from the specific features of plant forms, methods of changing the nature of a plant (in this case cotton) in the desired direction—for instance, of reducing cotton's hereditary requirement for heat. Therefore I strongly advise selectionists, in particular young workers, to study the developing Michurinist biological science still more thoroughly, to learn its theories from concrete examples—for instance, from the example of changing spring wheats into winter wheats or winter ones into spring ones.

There should also be an exchange of experience gained in scientific work, particularly that scientific work which helps practice either directly or indirectly. It would be very good if the U.S.S.R. Ministry of Agriculture were to organize periodic five- to ten-day seminars for workers in research institutions and higher agricultural schools, with the aim of exchanging experience, advancing theoretical qualifications and mastering effective new theories of biology that promote the practical work of agriculture.

On the Essence of Heredity and the Variability of Organisms.—The conditions of the environment are the prime factor in the development of the organic world. It was from the conditions of the environment that the living body first arose, and ever since living bodies have built themselves from the appropriate conditions of the environment. Therefore the living body represents a unity of the body and the appropriate environmental conditions. This unity consists in assimilation, in assimilating the conditions of the external environment to the given body. Moreover, it should be understood that the external is that which is assimilated and the internal, the body, that which assimilates. In an organism each part of the living body is internal with respect to itself and external with respect to the other parts of that organism. Therefore assimilation is always connected with dissimilation. Metabolism takes place in an organism through assimilation and dissimilation. The environment serves as the source of the substances that, through the agency of a viable body, become living.

Assimilation and dissimilation are necessarily intrinsic to a viable body. In other words, nourishment is intrinsic to life. Without nourishment, without assimilation and dissimilation, a living body becomes nonliving. But if a body that has ceased to be living has retained its structure inviolate, then it retains its viability and can again become living if the conditions for the process of assimilation and dissimilation exist in the environment. Such a body can become living if its nourishment is resumed. In short, when a living body ceases to be living, it may be in one of two states: nonliving but viable, if its structure is inviolate; or nonliving and dead, if its structure has been violated and it can no longer form a unity with the appropriate conditions of the environment, can no longer assimilate them.

Although the environmental conditions are the most important factor in the development of organic forms and the organic world in general, the living body plays an active part in this development. It actively selects from the environment the conditions it requires for assimilation, and it also actively opposes the inclusion in the process of assimilation of conditions and substances that are alien to it by virtue of their form and condition.

What are the conditions a living body needs for life, for assimilation, for growth and development? The answer to this question is as follows: It needs the conditions from which and in which the living body first appeared, from which and in which the given physiological process arose. These conditions are also necessary for the same physiological process to be repeated in subsequent generations. Herein lies the essence of the hereditary properties of a living body. A living body must necessarily assimilate those conditions, and those forms of their transformation, from which and through which it first arose.

How many hereditary properties does an organism possess? An organism possesses as many hereditary properties as it has different physiological processes and reactions to conditions that it does not require. Every living body, every organism possesses an infinite number of hereditary reaction properties. Heredity is the requirement of the living body for definite conditions of life and definite reactions to the influence of those conditions that are not required for life but that are in the environment and act upon the living body.

If any of those conditions that are necessary to the origin and development of a given physiological process are absent from the environment, this process will not arise or develop. If the process is important for the life and development of the particular organism, then the life of the organism will cease or its further development will be suspended. The organism will wait, as it were, for the necessary conditions to appear in order to continue a given physiological process. For instance, if winter crops are sown in the spring, the process of vernalization will not occur because of the absence of low temperatures. The plant will wait, as it were, for low temperatures to set in, and when they do the process of vernalization arises and continues.

In general, if the necessary conditions are not present, the given hereditary property will not be realized. The internal possibility (or rather, necessity) does not become a material reality, in this case a physiological reality. If the organism can develop without the given process, then the undeveloped character or property will not appear; it remains latent, or recessive, as we say. But the internal possibility or necessity is retained by the following generation; and, given the necessary conditions, the process may develop and the organism will acquire the given character or property. This is why by no means all hereditary properties are manifested in every generation, as can easily be observed in vegetable and animal organisms. Organisms with similar hereditary properties may possess different characters and properties, may exhibit so-called nonhereditary variation or fluctuation.

How does the living body lose any of its old hereditary properties and acquire new ones? Let us recall that heredity is the requirement for those conditions of the origin and development of a physiological process that were responsible for the appearance of the process in preceding generations. Furthermore, a living body possesses the active ability to select from the environment the conditions it needs and to oppose the inclusion in the process of assimilation of alien—i.e., new—conditions. This is what we call the conservatism of hereditary properties. The conservatism of heredity ensures the stability of organic forms, prevents them from changing under the influence of environmental conditions.

The conservatism of hereditary properties results from the physiological coordination of the processes of the organism, which is connected with its definite chemical and physical structure, the structure of a viable body. This ensures the relative stability of plant and animal forms through the generations. In order to prepare the organism to assimilate new—i.e., alien—conditions while undergoing the given physiological processes, we must disturb, must break down this physiological coordination, i.e. the conservatism of this or that hereditary property.

I. V. Michurin wrote that in order to change heredity we must force the plant organism to accept new conditions for building its body. This can be best and most easily achieved, as I. V. Michurin established, by crossing plants of different but allied biological species or by crossing varieties of the same species that have originated in sharply differing conditions. As biological species are physiologically incompatible, the interspecies hybrids will revert in the course of generations into pure forms of the parental species. A third species that did not participate in the interspecies crossing may also appear. Although

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interspecies hybrids revert in the course of generations to the initial species, the plant forms of these species differ from those used for crossing. These new and different forms are the result of the assimilation by the hybrid varieties of new conditions to which the parental forms used for crossing were not accustomed. In interspecies crossing the conservatism of the hereditary properties of the hybrids is greatly disturbed. Therefore such an organism is capable of assimilating conditions unnatural to the parental forms used in crossing. Thus hybrid plants obtained by interspecies crossing must be cultivated in appropriate conditions in order to ensure that not merely new forms in general but the desired forms, the desired varieties are obtained. It can easily be observed that if hybrid plants obtained from the same interspecies crossing are grown in different conditions, varieties of differing economic value are obtained.

This is to be explained by the fact that although the living is created through the agency of the viable, it is nevertheless created out of the nonliving, and therefore the heredity of the living body—that is, its requirement for the very same substances and conditions for repeated development in subsequent generations—will depend upon the nonliving substances and conditions that first gave rise to it.

Many experiments in changing spring varieties of cereals into winter ones have helped to establish that the body of a wheat plant that by heredity is a winter (rather than a spring) variety develops at the point of growth from the products of assimilation of autumn conditions. The chief external factor determining the hereditary winter quality (property) is the quality of the autumn light, assimilated at an appropriate temperature, and also the temperature at which the body of the point of growth builds itself from these conditions. Experiments have shown that one and the same spring variety when changed into winter forms in different climatic conditions will yield different winter plants with differing hereditary properties of hardiness. As a rule there appears a hereditary resistance to the type of winter common to the area in which the winter forms were created from spring ones by autumn conditions.

Experiments in changing spring plants into winter ones clearly show that the living did not only at some time, in some place, under a certain combination of circumstances, appear (arise) out of the nonliving but that thereafter the living always arises out of the nonliving through the agency of the living. A living body (an organism) creates the conditions for transforming the nonliving into the living. But as the living body possesses the property of conservatism, i.e., of selecting the conditions it needs from the surrounding environment, its descendants are as a rule identical with, or in a high degree similar to, their ancestors. If the conservatism of heredity is disturbed, however, and if the property of selectivity of conditions for the origin and development of the given physiological process has been weakened or destroyed, new conditions may be assimilated. In that case there appears a different living body with different hereditary properties, i.e., with a different selectivity as regards the environmental conditions.

For repeated development of the given physiological process in subsequent generations, the conditions from which this process originated in the preceding generation will be required. This is what is meant by the concept of adequate variability of heredity, adequate to the condition from which the given changed living body first arose. Here, of course, we mean the change in the structure of the living body in the process of development, in the process of assimilation and dissimilation, and not as a result of mechanical or chemical damage.

When a living animal or plant body is subjected to radiation or to various strongly active chemical substances, what happens is not an alteration in heredity, not the building of the living body but a violation of its structure. If the action does not damage the structure very seriously and the living body is still viable, i.e., capable of assimilation, then new, that is to say changed, parts of the living body will arise from the assimilated environmental conditions. The hereditary properties of these changed parts will similarly be adequate and appropriate not to the influencing factors, the radiation or chemical substances that damaged the structure of the living body, but to the conditions from which this changed living body built itself by assimilation.

Weismann and Morgan asserted, and their followers in biological science continue to assert, that progeny do not spring from the living bodies of the parents but from the so-called germ plasma, from a special hereditary substance, and that all preceding generations also sprang from this hereditary germ plasma. The living body (the soma) is mortal, but the germ plasma is immortal. After Weismann, the germ plasma began to be described as a hereditary substance consisting of genes, i.e., granules of a special hereditary substance to be found in the cell nuclei. They now assert that this hereditary substance is desoxyribonucleic acid. From these assertions it follows that the living body, which can be called the soma, does not possess heredity. Heredity, they maintain, is contained in a separate substance found in the living body (the soma). It is to the search for this hereditary substance that workers in so-called chemical and physical genetics are directing their efforts.

That the embryos of new generations appear, take their existence, not from the soma, the parents—in this Weismann and his followers are correct. It is also correct that the source of origin of progeny is the same as the source of all preceding generations (I shall have something to say about this later). But it is wrong to assert that there is a mythical hereditary substance existing apart from the living body (the soma). It is equally wrong to deny that the living body (the soma) possesses hereditary properties, i.e., the fundamental properties of the living body. For this is to deny precisely those properties of assimilation and dissimilation inherent in all living things. Nor can a property of the living body, i.e., the property of heredity, be ascribed to a nonviable substance, for instance desoxyribonucleic acid. By this we do not deny the appearance in a living body of new hereditary properties as a result of its assimilation of desoxyribonucleic acid (DNA) secreted by other bodies of the same biological species. And when DNA, or any other substance, is assimilated, when it undergoes modification, changes and becomes an integral part of the living body, according to the law of adequacy the repetition of the same processes in subsequent generations requires the same conditions, the same substances, that were first assimilated by the given living body.

These errors prevent many biologists from understanding correctly and conceiving correctly the essence of living bodies, the essence of the development of the organic world.

The source from which living things sprang and from which every living thing continues to spring is, as we have already said, the environmental conditions, and not the germ plasma. As the living body possesses heredity, it selects from the environment only the conditions and the substances from which it was built in preceding generations.

The sex elements, the embryos of new organisms, although not formed directly from the living body of the parents, are formed in the living body of the parents from substances secreted by different organs (glands) of the parent organisms. But, as we have already said, the environmental conditions are the source of the life and development of organisms. From the environment the living body assimilates the appropriate substances. In the conditions created by the organisms these substances finally through assimilation and dissimilation turn into a living body. Hence the source of the living body, including the embryos of organisms (sex cells) of both preceding and subsequent generations, is the nonliving environment, nonliving nature.

The embryos of new, freshly arising organisms may be identical with preceding generations in their hereditary properties, or may differ from them in some hereditary properties. If the embryos of new generations originate from the same substances and in the same conditions as did the preceding generations, they will have the same hereditary properties as the preceding generations. On the other hand, if the embryos of a new generation originate from different substances and in different conditions, some of their hereditary properties will be different. This is the only way in which organic forms, both unchanged and changed in different degrees, originate. In the same way, some kinds of forms will engender varieties of other biological species. Naturally, species originating from other species are allied kinds of forms, and

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in this respect Charles Darwin correctly maintained that the more closely allied the species are, the greater the competition between them will be. But Darwin was incorrect in extending this proposition to embrace the intraspecies relations of individuals.

In spite of a number of firmly established instances indicating that in appropriate conditions certain biological species engender others (and these instances are easy to verify and repeat), biologists often ask in bewilderment: "How can this be? For instance, how can hard and soft wheat engender rye? How can the 28-chromosome hard wheat Triticum durum engender embryos, i.e., grains, of the 42-chromosome soft wheat Triticum vulgare? We cannot imagine it." And since they cannot imagine it, then, in their opinion, the instances of some biological species engendering others are not worthy of consideration.

This unscientific approach to facts of biological science occurs, in my opinion, because the scientific workers who raise this question and are unable to answer it themselves are convinced that they know how wheat plants, hard wheat, for instance, reproduce embryos (grains) just as hard as those of the parent organism. They claim to understand this process quite clearly. Such scientific workers confuse the generally observed facts of the reproduction by plants and animals of like progeny with the essence of this phenomenon; they do not know the essence of the biological processes that give rise to the embryos of progeny in the parent organisms. These scientific workers also do not know, or rather fail to consider, the fact that biochemistry is a long way from having laid bare the chemical process of the building of a living body.

The engendering by certain kinds of forms of other kinds of forms proceeds according to the same laws and in accordance with the same processes as the development of embryos of new and unchanged progeny in the body of the parental form. Both the first and the second spring from the nonliving, but through the agency of the living.

Practical work is not only a criterion of the correctness of theoretical surmises and conclusions, it is the chief means of acquiring knowledge. Therefore to deny the possibility of the engendering of rye by wheat, for instance, under certain conditions means to be at variance with the facts and with the experience of many centuries of farming in the foothill areas of the globe. The facts are that in these areas wheat has been sown for centuries, while rye is not sown there. Nevertheless, the wheat fields are, as a rule, to some extent adulterated with rye. This rye is called fieldweed. But many of its forms do not differ in economic value and properties from cultivated rye. This rye belongs to the same biological species as the cultivated rye, Secale cereale.

To deny that under certain conditions wheat engenders random grains of rye which subsequently in the same conditions swiftly multiply and crowd out the wheat means to close one's eyes to life and to the experience of practical farming. Since wheat does not engender rye without cause, but only under certain conditions, it follows that once the causes, the conditions for the engendering of this wheat-rye are analyzed, they can be eliminated by agrotechnical methods and a practical means of freeing the foothill areas of these persistent weeds can be furnished. The same holds true for the reproduction of 42-chromosome soft wheat by the 28-chromosome hard variety, the engendering of wild oats by oats, etc. The latter two examples are very important for the work of the collective and state farms. They are particularly important for the southeastern areas of our country and for Siberia and the grain-growing regions of the Kazakh Republic, where the cultivation of hard wheat for seed must be correctly organized and where a struggle must be waged against the biological source of the adulteration of hard wheat by soft and against the biological source of that persistent weed, wild oats.

Michurinist biology's life-tested method of solving profound theoretical questions through the accomplishment of important practical tasks is the high road to a correct and effective knowledge of the organic world.

Michurinist biology, in close cooperation with the practical experience of the collective and state farms, is creatively developing the materialist principles of Darwinism and freeing it of erroneous Malthusian tendencies. Our biological science proceeds not only from the fact that the living organic world represents a unity of organic forms and their environmental conditions but from the fact that the environmental conditions are the prime factor in the development of the organic world. In short, as the environment is, so will be the organic world.

S. T. Yakushev correctly writes (Agrobiologia, No. 4, 1962) that the living is the dialectical opposite of the nonliving from which it sprang.

It has already been said that a living body can result only from the unity of a viable body with its environmental conditions, i.e., unity with the nonliving from which it sprang. Without this contradictory unity there can be no vital process, no assimilation or dissimilation, no transformation of the nonliving into the living.

In their speeches and writings, many Michurinist biologists use such expressions as "the unity of the living organism and its conditions of life" or "a living body is in unity with its conditions of life." These expressions are inaccurate; they do not convey the essence of the phenomenon. For the living organism itself represents the unity of an organic form, or organic body, having a certain structure with the conditions of its life. If you separate from the living organism, from this unity, its conditions of life, instead of a living organism there will be a nonliving organic form. But as long as the nonliving organic form does not lose its structure it is not dead, although it is no longer living. It is nonliving but viable. When such a nonliving but viable body is united with its environmental conditions, the vital processes are resumed. The living body is the dialectical unity of a nonliving but viable body and its environmental conditions.

On the Law of the Transformation of the Nonliving Into the Living.—Had nonliving nature not possessed the potential property of transforming, in appropriate combinations and conditions dictated by necessity, into living bodies, in the first place life would not have appeared, and in the second place living bodies could not have developed, modified and varied. The sum total of the knowledge accumulated by materialistic natural science proves beyond doubt that life appeared under appropriate conditions from nonliving matter. The knowledge accumulated by our Michurinist biology has led us to the conclusion that after primary life had been formed under appropriate conditions from the nonliving, the living continued, according to the same laws, to evolve from the nonliving, but through the agency of the living. The living only creates the conditions necessary for the transformation of the nonliving into the living. Therefore there exists and operates a more general law linking nonliving nature with living matter, according to which nonliving matter's property of potential transformation into living matter is realized. I cannot call this a biological law. I believe it pertains more to chemistry. But it is a chemical law according to which chemical elements and their compounds are transformed into viable bodies that live, grow and develop according to their own specific biological laws.

It is common knowledge that biological laws are neither chemical nor physical laws, just as the laws governing the development of human society are neither biological nor chemical nor physical. All the innumerable chemical and physical processes in a living body develop according to both discovered and undiscovered chemical and physical laws, but all these physiological processes are subject to the living, are subject to the laws of life, that is to say, to biological laws.

The study of the chemistry and physics of living matter is extremely important not only for the practical purposes of medicine and agriculture but for theoretical biology as well. Where theory is concerned, it is especially important for understanding the law of the transformation of the nonliving into the living through the agency of the living. It is this chemical and physical law that carries chemical processes beyond the limits of chemistry. This is why it is very important to study ever more thoroughly the chemistry and physics of living matter. But one must be fully aware that the study of the chemistry and physics of living matter, however thorough, cannot replace biological study, biological knowledge. No chemical or physical knowledge of living matter affords an idea of the biological laws according to which the organic world lives and develops. The study of the chemistry and physics of living matter, therefore, while extremely important, is only one of the

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preconditions for a materialistic cognition of biological laws.

And, conversely, one of the most important preconditions for profound study of the chemistry and physics of living matter is a knowledge of the laws discovered by our materialistic biology.

All branches of science, like all the phenomena of nature whose study constitutes the goal of science, are interconnected. But it is necessary to remember that the goal of science is not so much to find resemblances between natural phenomena as to find distinctions, up to and including differences within singularity, the breaking down of a single phenomenon into its objective contradictory aspects. Only such study leads to disclosure of the essence of phenomena, to the discovery of objective laws.

Any organism, any part of a living body possesses biologically a species quality. Just as everything in the inorganic material world consists of chemical elements and their compounds, so the whole organic world consists of biological species. Subspecies, variants, strains, varieties and individuals—all these are different forms of existence of biological species. A biological species is a special qualitative state of living matter, it is a unit of the organic world. Any microbe, plant, or animal organism belongs to a biologically distinct species.* Therefore the whole organic world—microbes, plants, and animals—lives according to a single law: the law of life of the biological species. This law is that the entire structure of an organism, all its organs, all the varied physiological processes—the entire life of the organism and of each part of its body—is in one way or another directed toward multiplication, toward increasing the mass of that particular biological species, one of the forms of existence of that species being the given organism, the given living body.

The law of life of the biological species is the general law of all living matter. All other biological laws, such as the laws of heredity and its variability, all the physiological processes taking place in a living body, are subordinated to it. In general, everything is aimed at increasing the mass of a given specific biological species in given specific conditions of the external environment. Without due regard for, without a knowledge of the law of life of the biological species, it is impossible to have a correct understanding either of the interspecies variability of properties and characteristics of plant and animal forms in conditions unnatural to them or of the stable transmission by these forms of their hereditary properties when raised under accustomed conditions.

The law of life of the biological species bears upon the sum total of facts testifying to the so-called purposiveness of the structure of plants, animals and microbes. I say the "so-called purposiveness" since there is not and cannot be any purpose in nature. Purpose is bound up with consciousness, which is absent in nature. It is clear to everyone that water flows downhill without any purpose, without displaying any volition, but solely according to the law of gravity. Everything in nature, both organic and inorganic, happens this way. Everything evolves and disappears according to its own specific laws. These elementary truths are common knowledge. In no branch of natural science pertaining to nonliving nature has the question of so-called purposiveness arisen for a long time.

In the branch of natural science dealing with living nature, i.e., biology, the question of purposiveness of structure has, however, always existed and still exists. A one-sided examination of the life and development of microbe, plant and animal biological species seems to disclose a purposiveness in their structure and behavior. This is testified to by the structure of organisms, their various physiological processes, the relations of organisms within a species—that is, with individuals of the same species—as well as the relations with many factors of living and nonliving nature. All this variability indicates one thing, namely, that in any being (organism) or any part of a living body everything has a single purpose, and this "purpose" is to increase the living mass, the numbers of a biological species, and not merely of any species but only of that species to which the given organism or the given part of a living body belongs. This is the "purposiveness" that seems so evident and that cannot be rejected without sufficient reason. All this is the result of the action of the natural law of life of the biological species.

This law runs like a red thread through all the works of Darwin. But Darwin failed to formulate it because of his erroneous acceptance of Malthus' reactionary law of intraspecies overpopulation and consequent intraspecies competition. In reality, intraspecies overpopulation has never existed and cannot exist in nature. And if in nature there is no intraspecies overpopulation, neither is there intraspecies struggle and competition. One must not confuse intraspecies overpopulation, which, as has been said already, does not and cannot exist in nature, with overpopulation of individuals of different species, which always exists in nature. Overpopulation of individuals of different species, especially of closely related species, as a rule actually gives rise to interspecies struggle and competition. However, the interrelations of individuals of different species may be not only competitive, antagonistic, but symbiotic, and also relatively neutral (for example, the interrelations of plants and carnivorous animals).

All progressive scientists, including biologists, agree in rejecting the application of Malthus' contrived reactionary law to human society. But many people do not understand why the Malthusian reactionary law of intraspecies overpopulation in nature is rejected. Some of them seem to be shocked by our assertion that there is not and cannot be intraspecies competition for conditions of life.

They maintain that intraspecies overpopulation exists in nature, and hence its consequence, intraspecies struggle and competition, and that it is not a law contrived by Malthus with reactionary aims but a natural phenomenon that allegedly is generally observed. In their opinion, Malthus and the Malthusians err only in applying this biological law to social phenomena for reactionary ends. It is, of course, true that biological laws may be applied only to biological phenomena and by no means to social phenomena. But Malthus' law does not exist in either the plant or the animal world. It is not a law but a reactionary fabrication.

For proof of the existence of intraspecies overpopulation it is usual to take examples from forest life. Look at a birch forest, they say; there are thousands of adult birches, each tree bearing hundreds of thousands of seeds. All these millions of viable seeds, out of inherent necessity, should live—that is, should germinate and develop into adult trees—while in the given forest there are only a few clearings, not exceeding one or two hectares, that are free of trees. Obviously there is room in these clearings for only a few hundred adult trees. It follows that space (which is to say conditions for life) does not exist for every seed. And since every birch tree embryo strives to live, this allegedly leads to the inevitability of struggle, of competition between individual birches.

Such an answer inevitably suggests itself. This, they say, is the intraspecies competition that results from intraspecies overpopulation. So many individuals are born that all of them are not and cannot be provided with conditions for life. Only the strongest, the best adapted, survive in this competitive struggle; the others, the weaker ones, perish in the struggle against their stronger, better-adapted brothers of the same species.

This kind of superficial reasoning, which does not in the least disclose the essence of the phenomenon, a priori leads many people, including biologists, to the aforementioned conclusions, which allegedly correspond to reality

But the question may be put to people who argue this way: You say there is insufficient space in the clearing for all the birch embryos; but what would happen if in this forest not millions of seeds but only one seed, one embryo, were viable—would it find space (conditions for life) in the clearing or not? Do not forget that in nature a clearing free of birches is always covered with grassy vegetation, creating a close-knit layer of the soil that is the chief scourge of forest trees. This means there is no free space (conditions for life) in the clearing not merely for millions of birch seeds but even for a single seed. Herein lies the answer to the question. Try to disprove it! It is precisely because there are millions of birch seeds that the clearing will eventually be overgrown with birches. Individual shoots would never be able to overpower the grassy

* Interspecies hybrids are an exception, but they are temporary in the sense that they are either sterile or produce pure species forms in their offspring.

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vegetation and would perish, but hundreds of thousands and millions of seeds will overpower it, will crowd it out, and a birch forest will grow in the clearing. This is interspecies struggle and competition.

It may be objected that later, as the trees grow, the clearing will be too small for them, and that this is when intraspecies competition begins and the strongest force out the weakest. That is to say, both interspecies and intraspecies competition exist. And all this, those who so argue will add, is due to the overpopulation both of individuals of different species and of individuals of the same species. No, this is not so. We have already demonstrated the biological meaning of the fact that in nature there are thousands of times more seeds than adult birch trees. Had it been otherwise, the grassy vegetation—and not only the grassy vegetation—would have prevented the birches from growing in the given clearing. Many analogous examples show in their totality that in organic nature there exists a law of life of the biological species. The action of this law presupposes both the absence of intraspecies competition in nature and the obligatory existence of interspecies struggle, competition and symbiosis.

The whole organic world consists of biological species, units, i.e., specific qualitative individualities. All these biological species live according to a single law of life of the species. Those who observe the life of a given biological species cannot fail to note its so-called purposiveness. It is apparent, as has already been stated, in the structure of the organism, in its physiological processes, literally in everything that is connected with the life of the individuals of this species. But since the organic world consists of biological individualities, units, i.e., species, so from the operation of the same law of life of the biological species inevitably ensues the opposite, namely, the absence of so-called purposiveness in the structure and life of the organic world as a whole, as a contradictory entity. For example, it is purposeful, useful, to protect herbivorous animals from carnivorous ones, but of what use is this "purposiveness" for the carnivores? The organic world is interconnected not only with inorganic nature but within itself as well. Biological species are interconnected. Every one of them lives to some extent at the expense of other species, to their detriment. At the same time, the existence of every given species is useful, is necessary for certain other species.

The "facts" indicate that in nature much is born but little survives. When you look into it, however, the truth is that in nature not so much is born and not so little survives.

Not infrequently, moreover, the more individuals of a given species that are born, the more individuals (in terms of per cent) that survive at the expense of other species. This is how biological species flourish and die out.

In nature and in agricultural practice, all organic forms have been and are evolved according to the law of natural and artificial selection discovered by Darwin. For the majority of biologists this is indisputable. But the law of natural and artificial selection is understood differently by different biologists: Biologists of the Weismann school understand it one way, Michurinist biologists another. We followers of the Michurinist school in biology understand natural and artificial selection to consist of three inseparable factors: heredity, variability and survival. An ever deeper study of each of these three inseparably linked factors gives us a deeper and deeper understanding of the law of natural and artificial selection discovered by Darwin.

It has been repeatedly stated that there is no purposiveness in the structure of the organic world, that the organic world consists of biological species and that each species lives not according to some purposiveness but according to one and the same law of life governing all biological species. It has been stated at the same time that in studying the life of any biological species the attention is drawn by an organic teleology, that is to say, a purposiveness. Therefore the science of biology cannot simply reject or ignore it. Simply to reject purposiveness is to deny the essence of Darwinism as a theory of the development of the organic world, and this, of course, no one who understands science, theory, can ever do. However, to accept the purposiveness of the organic world is also impossible, since it runs counter both to the general [illegible]—i.e., the basic propositions of dialectical materialism—and to many facts observed in living nature, for example, all the facts of interspecies relationships.

The scientifically formulated biological law that has been found to govern the life of the species appears to us to settle this logical contradiction satisfactorily. The action of this law conditions both the so-called purposiveness within a species and the so-called unpurposiveness in interspecies relationships. But this so-called "purposiveness" and "unpurposiveness" in the structure and life of the organic world as a whole indicates that in nature there is neither purposiveness nor chaos, i.e., unpurposiveness. These concepts do not conform to the phenomena of living nature. If, for instance, biological science is to recognize the apparent purposiveness in the structure and life of a biological species, then it must also recognize in any concrete purposiveness an unpurposiveness in relations with other species. To accept intraspecies purposiveness means to accept the existence in biological species of consciousness, of will, without which any concept of purposiveness is impossible. The structure and life of a species, as has already been said, are conditioned not by some purpose or purposiveness but by the natural law of life of the species.

But perhaps we are simply interchanging words here, substituting for the word "purposiveness" the words "law of life of the biological species," while the essence of the phenomena of living nature remains the same? No, what we are concerned with here is gaining a more correct understanding of the essence, not merely switching words. The task of biological science is to disclose and correctly interpret, i.e., formulate, biological laws, the laws of the life and development of the organic world. Knowledge of biological laws, i.e., the laws of the life and development of microbe, plant and animal organisms, is extremely important for agricultural science and practice. The demands of practice and of life made it imperative for us agricultural biologists of the Michurinist school to gain a better understanding of the development of the organic world than has existed up to now in the biology of the so-called classical, i.e., Weismann, school.

The law of life of the biological species was discovered and formulated in the process of solving questions important for agricultural practice. And if it is not a law of nature but natural purposiveness, then it is hard to understand how, for example, it has been possible in practice to breed hens that can lay unfertilized eggs. What need is there for such purposiveness? In any case, there is no biological purposiveness here. These breeds of hen have no hereditary maternal instinct, they cannot brood and hatch out chicks. For what specific purpose have these hereditary properties been lost? Again, here there is no biological purposiveness. Or take, for example, seedless varieties of pears.

Many examples from agricultural practice can be adduced to refute natural purposiveness. When it comes to cultivated varieties of plants and breeds of animals, their properties and qualities purposively meet the satisfaction of human needs. But such purposiveness is not biological purposiveness, although cultivated plant varieties and animal breeds also do not cease to be biological species. People create such varieties of plants and breeds of animals for their own purposes. But agricultural practice has also taken upon itself concern for maintaining individuals of these biological species in the numbers necessary to man.

A biological theory that accepts purposiveness in organic nature cannot act as a guide for practice in obtaining the necessary varieties of plants and breeds of animals. More than that, not finding biological purposiveness in cultivated varieties of plants and breeds of animals, such a theory obliges biologists to count these varieties and breeds as biological abnormalities or to discount them altogether as biological species. The law of life of the species embraces all phenomena of the life of species—both wild and cultivated.

Manifestations of hereditary properties of organisms are also subordinated to the law of life of the species. For example, when in intraspecies crossing two genotypes differing in hereditary properties are combined in one hybrid organism, development proceeds along the line of those hereditary properties which under the given concrete conditions ensure an increase in the living mass, in the number of individuals of the given species

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The essence of the individual life of plants and animals consists in satisfying their inherent (and that means hereditary) requirements. The satisfaction of the requirements of microbe, plant and animal organisms means their individual development, beginning with inception and ending with natural old age and death.

Every plant and animal organism is one of the forms of existence of a biological species. The biological species and the individual are inseparable. This is why in the organic world the life of individuals and of the biological species is inseparable and is governed by the law of life of the species.

In taxonomy and agricultural practice, individuals are grouped according to variants and varieties of plants, breeds of animals, strains and races of microorganisms, while biological species are not made up of subspecies or variants, varieties of plants or of subspecies and breeds of animals. A multiple character is potentially inherent in each individual, and no matter how varied individuals may be, they are all diverse forms of one and the same biological species.

Adaptation of Organic Forms.—No biologist ever doubts the capacity of organic forms to adapt (accommodate, correspond) to their conditions of life, the conditions of the external environment in which and from which they arose and were formed. But how is this capacity acquired? Biologists of the Lamarckian school maintained and still maintain that adaptation is an inherent property of all organic forms. Therefore organic forms in the final analysis are relatively adapted. Some scientific workers who have no knowledge or profound comprehension of the modern theoretical propositions of Michurinist biology attribute them to the same theory of adaptation, i.e., to Lamarckism.

But the fact is that, according to the modern theoretical propositions of Michurinist biology, everything in the life of each biological species, and consequently of each living body, is directed, according to the law of life of the species, at preserving and increasing the numbers of the given species and not at hereditary variability, let alone the self-destruction that occurs as a result of some biological species engendering others. Is it possible to call the phenomenon of species formation adaptive variability? For example, when 28-chromosome hard wheat is grown in conditions unsuited to its life, random grains of 42-chromosome soft wheat appear in some ears. In such cases hard wheat is engendering soft wheat. This is actually more suited to life in these conditions. But already it is no longer hard wheat but soft wheat, that is to say it is a different biological species. Moreover, this species is a strong competitor of Triticum durum, the biological species that engendered it. This means that what has taken place here has not been the adaptation of hard wheat to life in the given conditions but something quite different. What has happened is the generation of a competitor, one better adapted to life in conditions to which the engendering species was ill adapted.

The same may be said in the case of the generation under appropriate conditions of rye by wheat and in several other cases. These examples by no means show that the property of adaptive variability is inherent in living bodies; on the contrary, they show that despite the well-known inherent resistance, the conservatism, of living organic forms, all conditions unsuitable for their life oblige them to change their nature, their heredity. These examples alone testify that the theory of adaptation does not correspond to reality. Therefore it could not and cannot be a guiding principle in practice, in directing the development of plant and animal forms.

However, biologists directly engaged in zootechnology and plant growing are as a rule supporters of this theory. This is explained by the fact that together with incorrect propositions, the theory of adaptation has something in it that is correct. Therefore the theory of adaptation must not be fully rejected, completely dismissed. The fault in this theory lies in the fact that without a scientific, philosophical analysis of the living body, without discovering its basic contradictory characteristics, the Lamarckian biologists observe the adaptability (accommodation) of organic forms to their conditions of life and erroneously consider this adaptability (accommodation) to be a consequence of a faculty allegedly inherent in living bodies to adapt themselves to the conditions of life. But in actual fact it is not that a living body adapts itself to new conditions but that the new conditions, through the process of assimilation and dissimilation, force the body, in spite of its heredity, to alter, to build itself appropriately (adequately) out of these new conditions. Out of these new conditions there arises and develops a new living body differing from the old one. This is the only way organic forms change.

Supporters of the adaptation theory may say, "This is just what we are talking about: When in new conditions there appear new organic forms adapted to these conditions, then it follows that organic forms have the inherent property of adaptive change." But to clarify the essence of the matter one must solve the question of what is the leading factor in the development, in the change of the organic world as a whole and of separate organic forms in particular. The theory of adaptation proceeds from the assumption that since the property of altering adaptively is inherent in living bodies, they therefore adapt themselves to changing conditions of the external environment.

Biologists of the Michurinist school do not deny that living bodies can and actually do alter, but they point out that it is important not to lose sight of another, opposite phenomenon. As a rule, everything in the living body, in the organism, is aimed at preserving itself, at opposing any change in its heredity. This is the conservatism of the hereditary properties of the living body. The living body and its hereditary properties are changed under the influence of new conditions of life if the living body builds itself out of them. This is why the conditions of life have been and always will be the leading principle in the development of the organic world. Any hereditary changes of organic forms are forced, the cause of such changes being the new conditions of life, if out of them a new, altered body is built up through the agency of the old viable body.

I have repeatedly stressed in my articles that the living body is a dialectical, contradictory union of the nonliving but viable body (this is one side) and the conditions of its life (this is the other side of living matter). These conditions, substances, are assimilated by a viable body. In this union, i.e., in the given case a living body or organism, the viable body is the active side and the conditions of life are the passive. A viable body actively chooses from the environment the appropriate conditions it needs for its life, growth and development. Therefore in a living body, which is the union of a viable body and the conditions of its life, the first side is active—it assimilates; and the second is passive—it is assimilated.

But why do Michurinist biologists consider the external environmental conditions, the conditions of life, to be the leading factor in the development of the organic world? After all, in living matter it is the viable organic form, the viable body, and not the conditions of its life, that is the active side. The conditions of the external environment, the conditions of life, are the leading factor in the development (change) of organic forms because the living builds itself only out of these conditions, out of the nonliving. The primary source of food for a viable body is the external environment, out of which conditions the organism builds itself. Living matter is built up out of the nonliving matter (food) that a viable body assimilates.

This all shows that substances of nonliving nature have the potentiality, in appropriate combinations and conditions, of changing into viable bodies, into bodies possessing the property of assimilation and dissimilation, i.e., the property of being able to feed themselves. As has already been said, in experiments in transforming spring cereals into winter ones and winter ones into spring, it can be observed that out of whatever external conditions a living body builds itself, such will be its heredity—that is, it will require just such conditions, will actively select them from the external environment in repeating its ontogenetic development in all succeeding generations. And this is the changing of hereditary properties in directions adequate and appropriate to those conditions of life out of which and in which a new viable body arose. The new viable body actively enters into interaction with these external conditions; various physiological processes take place that by their overall action transform a nonliving but viable body into a living, developing one.

The flaw in the theory of adaptation is its failure to take heredity, the conservatism of organic forms, into account. Consequently a chief factor in vital processes—the active viable body—is forgotten. This theory considers the conditions of life, which through the agency of a viable body are transformed into living matter, not as one of the contradictory sides of the

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living body but as the living body itself. Herein lies the one-sidedness of the theory of adaptation, and its consequent lack of correspondence with reality.

A living body with new hereditary properties arises in the old one, replacing its old structure. In general, the new arises in the old, and not from the old. The new, which means the changed, living body, arises in the old living body from substances developed in the old. The origin of the substances out of which any living body is built up is its external environment, its conditions of life. Failure to understand this and a number of other phenomena of living nature leads some biologists to accept Lamarck's theory of adaptation. They observe only what is obvious, they observe phenomena but do not subject them to the scientific philosophical analysis that discloses the main point, i.e., the biological laws and relationships resulting from the essence of the given phenomena.

In its time the theory of adaptation was progressive. But because of its one-sidedness it has been disposed of very easily, though quite unscientifically, by the mechanist-biologists, neo-Darwinists and Weismann and his followers up to the present day. They simply discard it as unscientific and unsupported by experiment. But these biologists do not ask themselves why it is that animal and plant raisers have for decades adhered to the theory of adaptation in spite of its one-sidedness. Nor should it be forgotten that the mechanist-biologists also do not accept the basic materialist proposition of theoretical biology that the conditions of the external environment are the leading factor in the development of the organic world.

The neo-Darwinists understand natural and artificial selection only in the literal meaning of the word. For them the quality of hereditary changes is not adequate to the assimilated conditions. The nature of mutations allegedly does not correspond to those conditions out of which, by assimilation and dissimilation, this living body (mutation) was obtained. The changing of heredity in identical organisms under the influence of new conditions of life allegedly goes on in various directions. Of these changed bodies only those that can live survive; those that cannot live perish. This is what the neo-Darwinists mean by the law of natural and artificial selection.

Is it not plain to all who are engaged in the practical side of plant and animal raising that this is not a law of nature but merely words that explain nothing? Because mechanical sorting out (even if it is done in natural conditions) is called a law, it does not thereby become a biological law and consequently a guiding principle in practice. Sorting out creates nothing new, it merely sorts out what already exists. In order to have selection it is necessary that what one wishes to select, or what should be selected, exist.

Darwin's natural and artificial selection, as K. A. Timiryazev correctly stressed, must be understood not literally but figuratively. As I have already said, by natural and artificial selection we mean the result of the action of three interconnected factors —heredity, variability and survival. The true development of Darwinism lies in an ever more profound understanding of these interconnected biological properties, a deeper knowledge of the laws of the development of the organic world. Practice requires that such a biological theory not only explain why the organic world is what it is but also indicate means of changing it. This is why it is so important for biological science to disclose objectively and define more precisely the scientific formulations of the biological laws inherent in the organic world.

The adaptation (accommodation) of organic forms does not proceed from their property of adaptability. They do not possess this property. The given nonliving matter, transformed through the agency of one living body into other new living matter, is always biologically adequate (appropriate) to the nonliving matter from which it arose.

An analysis of the winter-hardiness of winter forms—of wheat, for instance—obtained from spring forms by many agronomists and biologists in various regions of the Soviet Union irrefutably shows that as a rule these winter forms possess hereditary properties of resistance to the particular adverse conditions characteristic of winter in the region in whose autumn conditions the spring wheat was transformed into winter wheat, or, to be more exact, out of whose autumn conditions the winter body was built up in the points of growth of the wheat shoots. This is the only way to obtain organic forms suitable for and adapted to that external environment from which and in the conditions of which they arose.

In response to the great paternal concern of the Communist Party and the Soviet government for the development of science in our country, we workers in biology will further strengthen the ties between science and practical work on the collective farms and state farms, will direct all our efforts to fulfilling as quickly as possible the decisions of the 22nd Congress of the Communist Party of the Soviet Union, in the interests of building communism in our country.

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of internationalism truthfully illumine the life and struggle of the peoples of the socialist countries.

But sometimes it happens that the visits of writers to foreign countries not only do not bring benefit but are turned against the interests of our country.

When you acquaint yourself with the materials about the statements of some Soviet writers abroad, you cannot understand what they are trying to do, whether they are trying to tell the truth about the successes of the Soviet people or are trying to please the foreign bourgeois public at any cost. Such "tourists" give interviews right and left to various bourgeois magazines and news services, including the most reactionary, and in these interviews spread fables about life in our country with amazing irresponsibility.

The visit to France by the writers V. Nekrasov, K. Paustovsky and A. Voznesensky left an unpleasant impression. V. Katayev was careless in his statements during his visit to America.

They flatter an unstable person abroad, call him a "symbol of the new era" or something else in this spirit, and he forgets whence he came, where he has come and why, and begins to talk nonsense.

The poet Yevgeny Yevtushenko traveled in West Germany and France quite recently. He has just returned from Paris, where he spoke before many thousands of workers, students and friends of the Soviet Union. During this trip Comrade Yevtushenko, one must give him his due, conducted himself worthily. But he too, if one is to believe the magazine Les Lettres Francaises, did not withstand the temptation to win the praise of the bourgeois public.

The poet gave the members of his audience a strange account of the attitude in our country to his poem "Babi Yar," informing them that his poem was accepted by the people and criticized by dogmatists. But it is widely known that Communists criticized Comrade Yevtushenko's poem. How can one forget this and not draw conclusions for oneself?

The bourgeois press often praises some of our workers of the arts for not trying, as this press asserts, "to take the offensive under a covering fire of dialectical tricks" when their observations do not correspond to "Party doctrine."

Such praise is offensive to a Soviet person. Vladimir Ilyich Lenin liked to quote the poet Nekrasov's wonderful lines:

He detects the sound of approval
Not in the sweet murmur of praise
But in the wild screams of fury.

Comrade Nekrasov wrote this—not that Nekrasov but the other Nekrasov, the one whom everybody knows. (Laughter in the hall. Applause.)

Everybody must understand the times in which we live. Socialism has won completely and finally in our country. Now the frontiers of socialism have been opened wide. The army of builders of socialism and communism numbers more than a billion people. And more than three billion live on the globe.

If our forces are growing, the enemy is not sleeping. In fright at the growing power of socialism, he maliciously sharpens his weapons for the war he is preparing against the countries of socialism. The enemies of communism place hopes on ideological subversion in the socialist countries. Always remember this, comrades, and keep your arms in good working order, ready for battle. (Prolonged applause.)

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Comrades! You and I have discussed a big range of questions of importance to our state, to the Party's ideological work. The fact that we meet in a comradely atmosphere and discuss together all the problems that trouble us is an expression of the new situation that has taken shape in our country in recent years.

The people and the Party are deeply interested in having artistic creation develop along the right line in our country. The line of development of literature and art has been determined by the Party Program that was discussed by the whole people and received the universal support and approval of the workers, the peasants, the intelligentsia.

And as for how best and most correctly to carry out this line in artistic creation, each of us decides in accordance with the understanding of his duty to the people and the specific features of his talent, his artistic individuality.

The meetings of leaders of the Party and government with workers of literature and the arts, the criticism of shortcomings, the mutual determining of new tasks that life has presented, the frank talks that take place during these meetings—all this shows that we and you are unanimous in the judgment of the successes and shortcomings of literature and art. I think that today's exchange of opinions too will be of great importance for the further development of literature and art. (Prolonged applause.)

We call upon the workers of Soviet literature and art, true aides of the Party, to rally their ranks even closer and under the leadership of the Leninist Central Committee to direct their efforts toward winning new successes in the building of communism. (Stormy, prolonged applause. All rise.)

After Biology Resolution: DNA and Controlled Mutation

Biology and Medicine: TOWARD NEW HEIGHTS. (By Prof. N. Zhukov-Verezhnikov, member of the U.S.S.R. Academy of Medical Sciences; Profs. I. Maisky and V. Gostev; Docent G. Tribulev; and Candidate of Medical Sciences N. Artemyeva. Meditsinskaya gazeta, Feb. 5, p. 1. Complete text:) Our country's scientists have welcomed the resolution of the Party Central Committee and the U.S.S.R. Council of Ministers on questions of the development of biology.* Its promulgation is indeed timely, since at this very moment new opportunities for enriching the practical work of all branches of knowledge connected with the biological sciences are opening up.

We would like to discuss in this connection one of the most important questions, that of medical genetics. This branch of science has long been under the influence of pessimistic views that maintained the irremediability in principle of cytogenetic lesions lying at the basis of hereditary diseases, as well as of the processes of cell aging and the degeneration of normal cells into cancerous ones. Now, however, such advances are being made that these opinions are bound to undergo a radical change.

The theory of the irreversibility of hereditary anomalies was closely linked with the views that the hereditary basis of an organism can change only accidentally, unpurposefully. And yet as far back as at the time of the outstanding works of I. V. Michurin, biologists in the field of selection had discovered methods whereby the heredity of plants and animals could be purposefully controlled. These methods could be either biological or chemical. The former, in the form in which they were worked out for animals and plants, are of course inapplicable to man. So doctors have long awaited the time when it would be practicable to remedy cytogenetic defects with the help of chemical preparations, when in the history of medicine the era of "genetic medicinal preparations" would be inaugurated. However, to achieve this it was necessary to prove not only the controllability in principle of genetic processes but also the possibility of using chemical substances for this purpose. An important step has recently been taken in this direction: A chemical characteristic of the interrelation between nucleic acids and proteins has been found.

This kind of research had attracted attention chiefly through A. I. Oparin's book "The Origin of Life on Earth," which appeared before the war and which oriented biologists to the study of fine molecular processes as being the chemical basis of the development of all living matter. The wide participation of microbiologists in genetic research promoted the development of this trend, now known as molecular biology.

A number of investigations, especially the works of A. N. Belozersky and his school, have proved definitively that the

*Current Digest of the Soviet Press, Vol. XV, No. 4, pp. 3-5.

chemical composition of desoxyribonucleic acid (DNA) is specific for every type of organism; this represented an important new step in the study of the chemistry of living matter. Following this, thousands of experiments were devoted to determining the character of the link between specific characteristics of DNA and proteins. And if we now know most of what there is to know about this link, we owe this to the wide development of the principle of modeling genetic molecular processes on bacteria, viruses and cells in single-layer clone cultures. Microbiologists have obtained varieties of microorganisms and bacteriophages that can serve as models for studying the chemical aspects of genetic processes with exact quantitative measurement of changing properties and the possibility of fine analysis of chemical changes.

As is known, these experiments on microbes and viruses gave grounds for the assumption that biological hereditary changes have a definite chemical expression connected with peculiarities in the structures of DNA and proteins. Chemical changes of this kind are conditioned in particular by the fact that on the sugar-phosphate framework of DNA four nitrogen bases are linearly disposed, the order of which changes with hereditary variations. Subsequently, by crossing bacteriophages and by biochemical experiments, specialists in different countries succeeded in establishing the order of such bases on the DNA chain. It turned out that in the process of the biosynthesis of proteins, three bases on the DNA chain correspond to each of the 20 amino acids. The replacement or disappearance of the bases making up these triplets results in the replacement or disappearance of the corresponding amino acids in the protein, and consequently in a change of the protein's metabolic functions. Thus DNA, as it were, controls the biosynthesis of protein in the organism, and any defect in its structure causes an incorrect disposition of amino acids in the protein, this defect being inherited by the offspring cells.

These statements are in themselves of unquestioned value for medicine, since they disclose new sources of cell pathology in those cases where the defect is handed on from cell to cell (e.g., when a normal cell changes into a cancer cell).

The study of the "coding" of the amino acid composition of proteins has essential importance also for general biology. But is the deciphering of the genetic code the principle aim of biological and medical research? And is it true that discoveries have already been made in biochemical genetics that are the equivalent of those made in the atomic sphere, as the West insistently maintains?

The resolution of the Party Central Committee and the U.S.S.R. Council of Ministers emphasizes among the main tasks of biology the necessity for elaborating various methods of controlling vital processes, in particular metabolism, heredity and the directional changing of organisms. These instructions fully conform to the present state of science and its practical tasks.

But it should be admitted that this statement of the important fact of the correspondence between the alternation of bases in DNA and the alternation of amino acids in the protein by no means represents the conquest of the summit of modern biology—the mastery of new means of controlling heredity. The achievement of this aim still lies ahead, and Soviet scientists are doing everything they can to solve this problem in the shortest possible time. It is particularly important for medicine to master methods of treating cytogenetic hereditary anomalies. Indeed, if disturbance of the DNA structure results in distortion in the biosynthesis of proteins, and this in turn leads to certain hereditary diseases, malignant degeneration of the cells in cancer, and even aging, it is of the highest importance that modern biology, physics and chemistry be mobilized in the search for methods of correcting such chemical defects in the organism. But for this it is necessary to seek effective methods of controlling the structure of DNA with the aid of chemical substances.

At the July, 1962, session of the U.S.S.R. Academy of Medical Sciences in Leningrad, the Institute of Experimental Biology of the U.S.S.R. Academy of Medical Sciences published a classification of molecular genetic anomalies subdivided into mutational, transformational and regulational anomalies. On this basis the question arose of the necessity for an organized search for a positive scheme of regulation of genetic information, that is, of chemical control of hereditary processes. In other words, the question is one of finding some kind of genetic medicinal preparations. Such searches can bear fruit only if we proceed from the belief that there exist in genetic processes so-called channels of reverse relation "environment-protein-DNA." It is necessary to reject the still-current view that there is only one channel of chemical relation "DNA-protein." It is precisely this that led to the assumption that hereditary defects of cells cannot be corrected.

A number of facts making it possible to judge the practicability of this new trend have appeared in medical literature of late. Several foreign summaries have recently published data on the study of the influence of a number of chemical substances on the genetic information contained in DNA. It has been shown on microbiological objects that a change in the alternation of the nitrogenous bases in the molecules of desoxyribonucleic acid and ribonucleic acid under the influence of certain substances may occur not accidentally but in a law-governed manner, since the DNA strand is chemically heterogeneous. Thus the genetic information of the bacteriophage T-4 purposefully changes under the influence of 2-aminopurine, 5-bromurdine, ethylene ethane-sulfonate, hydroxylamine, proflavine and even such a simple combination as nitrous acid.

Some articles have recently appeared in which it is suggested that a change in the disposition of certain amino acids in protein causes a predictable re-arrangement of corresponding bases in DNA. All this is still a long way from obtaining genetic medicinal preparations, but it encourages confidence in the effectiveness of the research work.

What specific steps should be undertaken in this field? Success in studying the prevention and correction of molecular genetic anomalies depends first of all on the degree of elaboration of the genetic models on which the primary selection of future genetic medicinal preparations is to be realized. There can be no question of trying out these preparations directly in the clinic. Biological models therefore play an exceptionally important role here.

In the process of research and in characterizing genetically active (nucleintropic) substances, it will be necessary to make use successively of models of all levels of biological organization, from molecular to cellular and systematic. During the past few years a range of such models has been prepared at the Institute of Experimental Biology. Chief among them is the polyribonucleotide test. During this test metabolic synthesis is brought about in a test tube of a ribonucleic acid analogue that will very likely make it possible to evaluate approximately the influence of chemical substances on the actual process of formation of nucleic acids.

Then follows a series of virous and bacterial models, which even at the present time make possible a primary selection of genetic medicinal preparations according to their influence on hereditary defects in primitive organisms. This allows us to proceed already to experiments on single-layer cultures of cancer and normal cells.

Finally, the experimental period of tests of possible genetic medicinal preparations will be concluded by their introduction into specially selected pure strains of mice having hereditary defects analogous to those occurring in man. Among the above-mentioned models the lysogenic bacteria are of special interest. Being the most sensitive objects for the discovery of the genetic activity of cosmic radiation, they have been used for studying the genetic conditions in the orbits subsequently flown by our cosmonauts.

In further experiments carried out by the authors of this article, and also by V. I. Yazdovsky, A. P. Pekhov, N. I. Rybakov, I. I. Podoplelov, P. P. Saksonov, V. A. Kozlov, V. V. Antipov and others, it has become clear that certain chemical substances stabilize the DNA of these bacteria, as it were, and make them less vulnerable to genetic radioactive effects. Moreover, the influence of such chemical substances can liberate the DNA of some bacterial cells altogether from pathological information, brought by a bacteriophage, or block this information.

Thus, the possibility of controlling genetic processes and correcting hereditary molecular cell defects becomes quite probable. The necessary conclusions should be drawn from this.

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The ad hoc commission on questions of medical genetics of the U.S.S.R. Academy of Medical Sciences has elaborated methodological recommendations that make it possible to include more laboratories and departments of higher educational institutions and research institutes in this project. First of all, it is necessary to introduce microbiological and cytological models into the work of microbiological, cytological, pathophysiological and clinical laboratories in order to study molecular genetic anomalies and to seek means of correcting them through medicinal preparations. For this it is necessary to organize the centralized preparation by special means of pure strains of bacteria, phages and viruses, and also of analogous cytological models and mutant strains of animals. The best-equipped organic synthesis and natural compounds laboratories of the U.S.S.R. Academy of Sciences and the U.S.S.R. Council of Ministers' Chemistry Committee should render assistance to medicine.

It should be stressed that a position has been gained in the sphere of medical biology that permits the development of a decisive attack on many complex diseases.

Khrushchev Addresses Russian Farm Conference

LET US REACH NEW FRONTIERS IN THE DEVELOPMENT OF AGRICULTURE IN THE FIFTH YEAR OF THE SEVEN-YEAR PLAN.—Speech by Comrade N. S. Khrushchev on March 12, 1963, at Conference of Party Committee Secretaries and Directors of Collective Farm-State Farm Production Administrations of the Russian Federation. (Pravda, March 14, pp. 1-4; Izvestia, March 15. 15,000 words. Condensed text:) Dear Comrades! On behalf of the Central Committee of the Communist Party and the Soviet government, I cordially welcome the foremost agricultural workers of the Russian Federation, the directors and specialists of the production administrations, the secretaries of Party committees and all the participants in this conference. (Prolonged applause.)

This is the first big conference of agricultural workers of the Russian Federation since the reorganization of Party and Soviet agencies carried out in conformity with the decisions of the November plenary session of the C.P.S.U. Central Committee. It goes without saying that it is still too early to talk about summing up any results of the reorganization, much less its results for the cause of communist construction. Presumably we shall have such a summing up at the end of the year.

The Party is firmly convinced that the reorganization of the Party's guidance of the national economy will yield splendid fruit and will speed the implementation of the great plans for communist construction.

You are well acquainted with the essence of the reorganization of Party and Soviet agencies. Put briefly, it means that the Party organizations are now structured from top to bottom according to the production principle. By the decision of the November plenary session of the Central Committee, there have now been created Party committees of the production administrations and rural and industrial Party committees of the provinces and territories, while in the Central Committees of the Union-republic Communist Parties there have been set up bureaus for guiding agriculture and bureaus for guiding industry.

The Soviet agencies have been correspondingly reorganized. The reorganization of agricultural agencies had been carried out in the Party even earlier. As you know, we reorganized the Ministries of Agriculture. Questions of material and technical supplies for agricultural production were concentrated in the Farm Machinery Association, while questions of procurements were put under the Procurements Committee and the production administrations.

A year ago, fundamentally new agencies for the management of the collective farms and state farms—the collective farm-state farm production administrations—were established. The Ministries of Agriculture were charged with the functions of guiding science and the application in production of the achievements of science and advanced practice.

In this way, a well-balanced system for guiding agriculture has now been created in our country, one that makes it possible to exert effective influence on the development of collective farm and state farm production.

Why was such a reorganization necessary? Some comrades may say that the district Party committees and district executive committees worked pretty well too. This is true. They simply did not work badly. It can be said that the majority of workers in the district Party and executive committees did splendid work. They fulfilled the role entrusted to them with honor and did much to strengthen the collective farms and state farms and to rear rural cadres. And no one is discounting this work. The years will pass, but Soviet people will always remember with respect the Communists who, working in the rural district Party committees, honorably served the Party and the people. (Prolonged applause.)

But these are other times, comrades! The scale of production has grown, the demands made upon industry and agriculture have risen.

In these conditions the question of Party guidance of the national economy also arises in a new form.

The Chief Tasks of the Rural Workers of the Russian Federation.—Now that we are starting on the full-scale construction of communism, it is necessary to organize the Party's guidance of the national economy in such a way that our cadres are able to concentrate all their efforts, knowledge and organizational talent on the solution of concrete production questions. ...

The reorganization of the Party's guidance of industry, construction and agriculture that we are now implementing is in full accord with Lenin's teaching. We can say with pride today that the measures taken by the Party were illumined by the thought of the great Lenin. (Stormy applause.)

I think you will agree that our Party has now found a good form for administering the collective and state farms. The production administrations and the Party committees of the production administrations have great potentials for skillfully organizing production on every farm in the new conditions and for making better use of the rich possibilities of the collective and state farms.

You who are gathered here represent the largest republic in the Soviet Union, the Russian Federation. The collective farmers, state farm workers, specialists, scientists and leaders of Party and Soviet organizations of Russia have made a great contribution to the solution of the Party-wide and nation-wide task of increasing the output of agricultural products.

The data on the development of agricultural production during the past ten years are convincing evidence of this. It is a pleasure to me to cite these data in order once again to answer those who predict that we will not be able to cope with the difficulties in developing agriculture. It is precisely our forward advance in the most important direction—economic development—that the opponents of socialism now fear above all. Our successes in economic construction are of decisive importance. This is understood not only by people with a Marxist or a general education. The importance of the economy's upsurge is understood by all, is understood, one might say, by every person who has learned to eat. (Stir in the hall. Applause.) ...

As you listen you are probably thinking to yourselves, "All well and good. Now he is talking about successes, but first thing you know he will be criticizing again." That is correct, nor is it a bad thing. (Stir in the hall. Applause.)

The labor of the agricultural workers of Russia has been highly appraised by the Party and all the people. But now big new tasks confront us. Proceeding from what has been achieved, the collective and state farms must raise the output of agricultural products to a level that will permit the full satisfaction of the people's requirements for food products, will fulfill the tasks set by the 22nd Party Congress. ...

Comrades! This task lies on your shoulders, and it is completely realistic and feasible. If even an average harvest had

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Isaac Deutscher, The Great Contest, Ballantine Books Inc., New York, 1961

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1950s brought a tremendous revolt, open or veiled, against the controls, the censorship, the restrictions and prohibitions of the Stalin era. This revolt has not yet spent its force. The reaction against the Stalinist dogmatism is still developing in constant conflict with the conservatism of a ruling group nearly all the members of which have been brought up in the Stalinist school of thought.

The present situation is thus characterized by a growing demand for freedom of thought and expression on the one hand, and, on the other, by the desire of the ruling group to circumscribe that freedom and to save what can be saved of the canons and taboos of Stalinism. In this conflict at least one factor has definitely favoured the growth of freedom: the spreading awareness that intellectual freedom is a pre-requisite of national efficiency. The need for efficiency, industrial and social, is the greatest single ally of the Soviet universities. It is in the nature of things that freedom should have gained much more ground in science than in the humanities. Einstein's name has at last been placed on the roll of honour; one comes across serious, undogmatic discussions of the philosophy of science with special reference to the theory of relativity. It is in science also that the reaction against in-

tellectual isolationism and an eagerness to learn and assimilate ideas of non-Soviet thinkers and to exchange experiences with them have shown themselves first and foremost.

In the humanities the outlook has remained less encouraging. Here dogma, though bedraggled and humbled, shuffles on. But it can hardly do so for long. The contrast between freedom in science and the lack of it in the humanities is too striking to last. In the long run thought cannot remain half-free and half-slave. Even in the humanities there is a great gap between orthodox appearances and realities. The French once formed the distinction between *le pays réel* and *le pays légal* to describe such a gap in their politics. In the Soviet Union, too, there now exists a 'real country' which is very different from the 'legal' realm of officialdom. People in fact think and argue far more freely and audaciously than one can judge from official statements and curricula and even from so-called scholarly papers.

In economics, where the needs of efficiency cannot be ignored, there has been some revival of theoretical discussion, a little of which is reflected in the periodicals but most of which has been going on unofficially. A great deal of this discussion must, I am afraid, remain unintellig-

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racy the decisions reached were not the product of one man's will. The continuous existence of dictatorship and personal rule has always made Russian policies difficult for someone immersed in Western political habits and practices to understand. The most astute Western observers have professed to see but enigmas and puzzles when it came to Russia's behavior on the international scene. Where is the main puzzle?

Part of the answer lies in the undoubted fact that in a totalitarian or authoritarian system foreign policy is much more intimately connected with internal politics than is the case in democratic and constitutional societies. Thus some of the most crucial shifts and puzzling decisions of the Soviet leaders make sense only if we keep in mind the internal conditions that accompanied them. Was Stalin's pact with Hitler an act of shortsighted duplicity and desire for territorial expansion at the cost of Poland and the Baltic states? But the despot must have also feared the probable consequences of Russia's participation in any war—even a war Russia would have fought as part of a victorious coalition—for a regime weakened by a decade of forced collectivization and purges. The same element of totalitarian prudence, almost incomprehensible to the Western mind, accounts for the abrupt isolation of the USSR following the war, when the regime brutally and needlessly (said foreign observers) dissipated the good will it had accumulated in the West, not only by its actions but also by its statements and absolute isolation from its recent allies. A slower rate of subjugation of the satellites, a friendlier tone, could have meant credits for Russia's devastated economy and a delay in the awakening of the West to the danger of Communism. But what would have been the *internal* consequences of continued intercourse and friendly relations with the West in a society that had to be spurred to even greater sacrifices on behalf of industrialization, in a nation that had been taught to expect an easier and freer life as a reward for its wartime struggle?

This leitmotif of Russia's relations with the outside world has a long history and is but awkwardly summarized by a Marxist term: uneven development. To a Russian historian in the nineteenth century, this problem appeared in categories not entirely dissimilar to the considerations that must have agitated Stalin in 1945 or Nikita Khrushchev during the "thaw." S. M. Soloviev saw something providential in Russia's defeats in the West during the last quarter of the sixteenth century: "The withdrawal of the Russian nation into the remote northeast was important because it enabled the Russian state to grow strong far from Western influences. We see that those Slav nations which have prematurely come into contact with the West, strong in its civilization and in its Roman heritage, have declined, have lost their independence and some of them even their nationhood." But the departure of Russia from Europe had also its baneful influences: backwardness and weakness of social and economic development. So, Soloviev concludes, the Russian state had to turn west again, but this time its entrance was that of a great power.[1]

To the Western mind there is something irresistibly tragicomic in the continuity that extends from Ivan the Terrible chastising Kurbsky for being impressed with Western (Polish) customs and liberties to Khrushchev's propagandists chastising Soviet youths for playing rock-and-roll records. But the serious side of the ambivalence toward what was called the West and is now branded the capitalist world has always been found in two very prosaic facts: the need of imperial authoritarianism and then of Communist totalitarianism to absorb elements of Western material culture and technology without at the same time suffering political infection from abroad, and the psychological need of the educated classes either to rebel against or to rationalize their lack of freedom and the social backwardness of their country.

Both Panslavism and Slavophilism have been attributed to

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Life of Higher School: STUDENT OR SCHOLASTIC? (By Prof. N. Strelchuk, Rector of Moscow Construction Engineering Institute. Izvestia, March 17, p. 3. 1,500 words. Condensed text:)

After the law on the tie between school and life was passed, much that was new and useful came into the higher schools. The combining of instruction with production work was introduced. The theoretical level of schooling was raised. The number of lectures and practical lessons in mathematics, physics, chemistry and other basic sciences was increased. Instruction in certain new disciplines was introduced. Syllabuses were revised and somewhat improved. But as of now, this is where it ends. And after all, the law proposes far more profound changes in the activity of the higher school. ...

Of what does the schooling process consist now? It consists primarily of compulsory lectures. Quite often they boil down to a reiteration of the textbook, colored by the lecturer's individuality; far less often are they devoted to the most difficult, the newest and the most crucial problems of the given discipline.

Textbooks do not touch upon debatable problems. The basic requirement for a textbook is that its presentation of the material must not give rise to questions in the student's mind. The idea is persistently brought home to him that everything written in the textbook is "eternal" truth. Which means there is nothing to think about, the only thing to do is memorize. Well, what happens with new subjects, such as, for example, dynamic resistance, a subdivision of the resistance of materials? What is to be done when there is no harmonious theory, as in the technology of astringent materials? Is it to be considered the devil's work, unnecessary to the students, and that's the end of it?

I adhere to another opinion: Lectures and textbooks must cover moot questions, must formulate the prospects and paths of possible development of the given branch of knowledge. Then the students will start to think, to argue, to look for answers and to try to determine their own place in the development of technology. And this is really the basic task of the higher educational institution.

Laboratory work is overloaded. Along with serious assignments forcing one to study the apparatus and methods of research and to delve into the essence of phenomena, the program is filled with assignments that can be fulfilled in a purely mechanical way, according to instructions. Under the banner of heightening the realism of projects, the students are presented with an abundance of standard solutions, catalogs and albums for their course work, killing the desire to test their own strength and ideas.

So what we "accomplish" is that the student is turned into a schoolboy, fettered by obligatory courses and stuffed with "incontrovertible" truths. Since he hasn't learned in the higher school to resolve technical or any other questions independently, he is forced to spend years after graduation from the institute getting used to working without prompting and constant petty tutelage.

Of course, I have some good examples to cite, too. But they only confirm what I have said. Many graduates of the Moscow Construction Engineering Institute are perfectly at home in the most difficult production work. Our youngsters founded a large Institute colony on the construction site of the Bratsk Hydroelectric Station; Izvestia has written about this. The construction project is proud of them. They fulfill their responsible assignments beautifully and lead interesting, useful, intelligent

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lives. If one recalls the careers of these young engineers at the institute, it turns out that in their student years they had common Y.C.L. interests, all without exception are activists and all have been saved on more than one occasion by the str friendship that grew up in the construction detachments virgin land or on the mountain-climbing trails. It is the not in the lecture halls or the laboratories, that their inde ence was consolidated.

The traditions of the faculty and the prestige of the favorite professors have inestimable significance. ... But more often than not a stream of directives, regularized and qualified wi scores of instructions—how and what to teach, how and what ask in tests—engulfs the teaching collective, giving it no cha to find out the capabilities of each student.

The law says that higher educational institutio developed pedagogical science schools must be carry on the educational process according to their vidual plans. However, to this day all the higher consti schools are operating under the same general plan.

There are 60 professors and 300 candidates of scienc working at the Moscow Construction Engineering Institute This is its mighty collective power of reason. So have they no capacity to decide by themselves what the student needs and what it is possible to dispense with?

They could determine the content of all courses for ea faculty, accurately, right down to subject and subdivision. What a reserve of time is hidden here! And time is so scarce. After all, there is yet another big, important task that falls within the scope of the school years: expanding the cultural, political and moral outlook of the young person. Breadth of outlook is engendered by hundreds upon hundreds of discoveries one makes for oneself, reading Anatole France and knowing how to drive nails quickly and neatly, conversations until midnight with an interesting partner, Baltic cruises on a yacht, whatever is not obligatory, insofar as it is not included in the program for training the engineer, but nevertheless belongs to the category of obligatory for anyone who is intelligent. But where does one find the time?

The concept of a "free schedule" exists. A student entitled to it can take his examinations early, can cut certain lectures, etc. The instructions contain a mass of qualifications on the subject of who can take advantage of the free schedule. These students, of course, must be the outstanding ones. But why? We interpret the instructions broadly.

Incidentally, a large number of the engineers I mentioned in connection with the Bratsk Hydroelectric Station studied on this self-same free schedule.

The term "free schedule" is imprecise. This is a schedule that is made to correspond to the potentials and abilities of the student. One thing may be permitted to one, something else to another. The general schedule of the higher school should be made up of individual schedules. What is there to fear in this? That the students will choose the most interesting teachers? But this can only raise the quality of lectures. What is there to fear, if the students' choice is limited by the strictest possible examinations?

Not only a literate engineer, but also a strong-willed organizer and an energetic public participator must come out of the Soviet higher school, for the Soviet system of guidance is built upon broad public participation. The question of the student's full-fledged social training, perhaps even practical experience in this, should be seriously thought through. This is no less important than production work in one's specialty, if one considers the kind of businesslike, resourceful people production expects from us. All types of student self-government—the organization of dormitories, student clubs, theaters and film studios run entirely by the young people themselves—must be encouraged. It is necessary to believe in the young people, not to be afraid of unavoidable errors, not to offend them with inordinate tutelage, but to guide their initiative sensibly and tactfully.

One more thing. It is not enough to unburden the student of obligatory studies and present him with a full complement of good textbooks. A very fine organization of the teaching process must be ensured. For this, reading and drawing halls are [illegible] school"—laboratories with enough space so the student can not just "do the lab assignment" but conduct real, even though modest, experimental research. He must have a chance to do some independent work at a computer center. To put it briefly, what is necessary is a complete correspondence between the higher school's material and technical base, its teaching process, and the tasks that are entrusted to this higher school.

The Arts

IT IS NECESSARY TO WORK MORE, BETTER AND WITH BETTER IDEAS. (By Ernst Neizvestny. Pravda, March 15, p. 2. Complete text:) In these days I have been thinking a great deal about the responsibility of the artist to society, and also about my own work and my own responsiblity. One must strive to make works of art expressive and filled with ideas. Actually, ideas always constitute the firmest foundation of expressiveness. ... is in the very nature of monumental sculptors to address themselves to the people and to have a comprehensive world view.

We have the Marxist-Leninist world view, the most comprehensive of all those existing in the world.

... say to myself once more: One must work more and better, ... better ideas and more expression—only thus can one be useful to the country and to the people.

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equality, the speculative originality, which had made Bogdanov such a troublesome collaborator, so much the better.

At the beginning of May, 1909, the book appeared in Moscow, and from July 4 to 13, the enlarged Editorial Board of *Proletarii* met in Lenin's apartment. Lenin had prepared all the resolutions and motions. On his proposal, the editorial conference set aside the old Bolshevik Center, elected at the London Congress of 1907, and assumed the power to appoint, remove and legislate. It decided that "boycottism, recallism, ultimatism, God-construction and Machism" were all of them "incompatible with membership in the Bolshevik faction." In vain did Bogdanov question the right of a mere editorial conference to remove people appointed by the Bolshevik Center, or to repeal the resolution on "neutrality in philosophy" on which the Bolshevik bloc had been based. In vain did he protest the attempt to split the faction, and the methods of "coup d'état." The moves had been prepared and thought out to the last detail, and Lenin had the votes to carry his motions. There is no way of knowing how much the big book, which nobody had yet had the time to read but which seemed to tie all the "Leftists" up with religion and "God-creation," helped to weigh in the scale. By a small but safe majority, Bogdanov and his associates were declared to have "placed themselves outside the faction."

> Not outside the Party—Lenin explained precisely.—A party can include a wide range of opinions, the extremes of which may even be diametrically opposed to each other . . .

But in 1912, Lenin's faction was to declare itself the Party! And after 1917 it was to make even the state a mere reflection of the Party. What then would happen to the "wide range of opinions"?

The dissidents, a sizable minority despite the fact that Lenin had pretty largely in advance determined who should come to the enlarged editorial conference, withdrew at last and proclaimed themselves the only "true Bolsheviks": legally, because they regarded the acts of the conference as a usurpation; ideologically, because in their own minds they were true to the "original tactics of bolshevism" which had so often in recent years commanded a majority against Lenin. In token of the continuity of their bolshevism, they revived for their new journal the name borne by the first Bolshevik paper, founded by Lenin and Bogdanov at the end of 1904: *Vpered* (pronounced *Vperyod*), whence they were called for the next few years the Vperyodist Bolsheviks.

> Go your way, friends—Lenin admonished them in the columns of *Proletarii*.—We did our best to teach you Marxism and Social Democratic methods of work. We now declare decisive and irreconcilable war on the Liquidators of the Right [a sub-tendency among the Mensheviks, of which more later], and the Liquidators from the Left, who are corrupting the workers' party by theoretical revisionism and philistine political and tactical methods.

Materialism and Empiriocriticism, then, is first of all a document in an intra-Party struggle. This should not surprise us, for the same can be said of every line Lenin ever wrote for publication. Its primary concerns are to defend orthodox Marxism against every species of modification, revision, criticism or attack, and to convict Bogdanov and his associates of deviations from Marxist orthodoxy. But over and above this, the work has a more ambitious aim: to expound afresh the basic philosophical position of Marx and Engels, and to evaluate from its standpoint the main philosophical currents and scientific discoveries of Lenin's day.

Engels had insisted, and now Lenin insisted after him, that the recognition of a world independent of the percipient subject, and the recognition of man's ability through analysis and action to form an ever more exact notion of the nature of that world, are the prerequisites of modern science. To those who assert that there is no such "objective" world, or that it is forever unknowable, Engels answers that science and industry, man's knowledge-in-action, teach us how the unknown becomes known, how out of ignorance arises knowledge. It is this knowledge-in-action which enables us to test the correctness of our conceptions of a given phenomenon, by producing it out of its elements or determinants, by devising critical tests, by predicting and foreseeing, by revising and refining our hypotheses in terms of crucial experiments and observable errors. Many of the best pages in Lenin's book are quotations from Engels, followed by explanations and illustrations of this view. Passionately he asserts that, though the *known* be little and the *unknown* vast, the area of man's knowing and power to predict and plan and control is capable of indefinite enlargement. To postulate an *unknowable*, however, is to set arbitrary, self-degrading limits upon man's efforts to understand and master his world. In the midst of all the anti-rationalism that surrounded him in the post-1905 reaction, and that surrounds us in our own day, Lenin's plea for a rational, experimental approach to nature and society—however much he may have deviated from it himself in his own dogmatic authori-

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tarianism in the sphere of "Marxist orthodoxy"—represents an important contribution.

> Man's intelligence—he cries—may be only a feeble rush-light in the darkness of night, but I am not going to let that flickering flame be blown out by mystics and metaphysicians . . .

The one chapter of Lenin's book that has meaning beyond the limits of the immediate philosophical-factional controversy is Chapter V, entitled: "The Latest Revolution in Natural Science." Here Lenin handles the "crisis in science" that had just been proclaimed by Poincaré; the notion that "matter is disappearing," or being swallowed up by energy or dissolved into pure mathematical formulae; or that the material universe was dissolving, merely because science was stumbling from the one-sidedness of inert matter-without-motion into the contrary one-sidedness of motion-without-anything-which-moves. The approach here employed by Lenin, and more skillfully and subtly by Engels before him, is helpful, too, in considering fresh muddles which have arisen since their day: the supposed entrance of "spirit" into every phenomenon by virtue of the alleged inseparability of the thing-observed from the observer; the emergence of "free will" inside the atom via the principle of indeterminacy; along with other bewilderments of certain recent scientists turned amateur philosophers and philosophers turned amateur scientists, without sufficient mastery of the accumulated heritage of philosophic and scientific thought.

The weakness of Lenin's work, as Bogdanov hastened to point out, was its authoritarian character. Its proofs are all proofs by authority—the authority of Marx and Engels. The final touchstone is always a quotation from one of their works. The authority, on closer examination, almost always proves to be Engels. Curiously, though Lenin mentions the name of Marx scores of times, there is only one three-sentence quotation from the philosophical writings of Marx in the entire book. To be sure, Engels' more specialized *Anti-Duehring* and *Feuerbach*, if less seminal, are more systematized, more apposite to Lenin's immediate purposes. Still, the neglect of Marx by this orthodox Marxist suggests something concerning the limitations in his orthodoxy, like the Christianity of a theologian who forever quotes Paul but finds no use for the words of Christ.

When Lenin has succeeded in confronting some quotation from Bogdanov (or from anyone whom he has, by whatever literary

stratagem, link up with Bogdanov) with some quotation from Engels, and has shown some divergence between them, his task is finished. Lenin is not only "authoritarian" himself, but he insists that all his opponents must be authoritarian, too:

> Your clamor against argument from authority—he writes—is only a screen to conceal the fact that you substitute for the socialist authorities—Marx, Engels, Lafargue, Mehring, Kautsky—the bourgeois authorities—Mach, Petzold, Avenarius and the immanentists.

In pursuance of this idea that every man must have his authorities, Lenin matches a maze of quotations from Engels with a counter-maze of quotations from the "other camp," lumping together the most diverse names, on the philosophical theory, as Bogdanov wryly observed, that "who is not with us, is against us." By this device Lenin blames Bogdanov for things he has not said, and even for things he specifically rejects. It is sufficient that Mach has said them and that Bogdanov is a "Machist" and therefore "responsible" for all of his "authority's" views. And for all other Machists! And for all the utterances of any who has praised Mach or been praised by him! This "philosophical chain-reaction method," and "quotational shock treatment," as Bogdanov dubbed them, were calculated as much to impress the reader as to overwhelm the opponent. It was the method of all authoritarian organizations, Bogdanov observed shrewdly, to "hold the chief responsible for the activities of his subordinates" and oblige them to "reflect exactly his conceptions." Bogdanov's reply did not do a very good job of defending his own philosophical speculations, but he had probed the weakest spot in Lenin's intellectual armor.

The most notable difference between Engels and Lenin is the angry moral tone of Lenin's attacks, the opprobrious moral epithets that pepper his pages. Engels had spoken of three philosophical "camps": materialism, idealism and agnosticism. Insensibly, Lenin converts "camps" into "parties" and proclaims that "philosophy is a *partisan* struggle." Where Engels finds "philosophical agnosticism" to be a "shame-faced way of accepting materialism by the back door," Lenin enlarges the "shame" until it becomes a monstrous thing, a plot to drag in not materialism but "religion by the back door." Those in the "idealist camp" are at least to be respected as "open agents of reaction and religion," but those in the "agnostic camp" are to be exposed as covert agents, whose agnosticism is "only a despicable cloak of servility to idealism and fideism."

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Marx and Engels could be scornful and ironic in theoretical controversy, and devastating and reckless in their private letters to each other. But even in the *Anti-Duehring*, which so largely served Lenin as source and model, all that Engels aims at is to convict Professor Duehring of inconsistency and "higher nonsense." Nowhere do we find the imputations of evil intention that abound in Lenin's pages, or the passionately held belief that defects in a man's epistemological theories are defects in his character, willful immoralities of the spirit leading to inevitable political sin. ("Genuinely scientific works," Engels had admonished Duehring, "avoid such dogmatic-moral expressions as truth and error.")

If Lenin's philosophical targets disavow a view he has imputed to them, it is sinister trickery. If they have modified a view under criticism (his criticism or another's), it is but the better to deceive. If their views seem very close to his, or to his masters'—still worse: they are "surreptitiously and illegally borrowing" from materialism to hide their true intentions and confuse the right-thinking. As a whole, "professors of philosophy are scientific salesmen of theology." Mach and his school are "graduated flunkies of theism." They are all conspirators, plotting against science and the further progress of mankind. "The philosophy of Mach, the scientist, is to science what the kiss of Judas is to Christ."

This method of polemics, and the very epithets employed in it, derive from the intense ethical bias and passionate fanaticism of Russian thought. For reasons suggested in the first chapter, Russian nineteenth-century thought reduced politics to ethics, without so much as a residue of mere practical concern or experimental interest. Art and literature and criticism were no less questions of morality. Even science was a moral creed to live by. "Science," cried the gentle Herzen, "there is no reason why I should hide words in the depth of my soul—Science is Love!" And the problems of epistemology, the most difficult, subtle, and general problems that can engage the thought of mankind, were made into moral issues, too. The reader will find Lenin at enormous pains, by the "chain-reaction and quotational shock-treatment" methods, to reduce every opponent's views to "solipsism." When he has driven his opponent into that corner, his indignation knows no bounds. As we read, we are reminded of the men of the Russian enlightenment, who, like Belinsky and Herzen, regarded solipsism (extreme subjectivism) as a kind of logical-moral defect of character, arrogant, egotistical, vile. Consistent solipsism, they thought, makes the petty ego of its disciple into the measure of truth and error, right and wrong, good and evil, permitting him to betray all ideals, logically leading him

to commit any crime from murder to suicide. When dealing with such issues, there is more to Lenin's scorn than worked-up indignation and the desire to discredit his factional opponents (more than his "I shall always act thus whenever a split is involved"). The overtones of anathema and excommunication are part of that Russian polemical heritage which caused the Slavophiles to brand Chaadaiev an "apostate," Granovsky a "corrupter of the youth," Herzen a "lackey in Western livery." And we can hear no less the Westernizers retorting with the epithet "Slav gendarmes in the name of Jesus Christ" or Merezhkowsky accusing Gogol of "betraying Pushkin" by his "all-devouring sickly mysticism."

Belinski, atheist though he was, had proclaimed the need of a "faith" for "without faith I cannot live." Herzen had rejected "the heavy cross of disillusioned knowledge." Odoevski had cried that "to be happy, man must have a luminous axiom, one that is all-embracing, one that brings deliverance from the torment of doubt." This spirit, unexpressed, goes far to explain the fury with which Lenin attacked any slightest "deviation" which might sow in the solid granite of his own faith the fissuring seed-corn of a doubt:

> You cannot eliminate even one basic assumption, one substantial part of this philosophy—it is as if it were a solid block of steel—without abandoning objective truth, without falling into the arms of bourgeois-reactionary falsehood.

Materialism and Empiriocriticism appeared too late to have much influence upon the conference proceedings which expelled Bogdanov and his friends. It was little noticed, little sold, little read. Bogdanov as philosopher was not of large enough caliber to have attracted much general attention. Moreover, by 1909, the entire controversy, epistemological and ethical, was already on the wane. Insofar as the book represented a determined counter-thrust against the religious, mystical, soul-searching, anti-rational moods of post-1905 Russia, it had been delayed too long because of Lenin's "tacit bloc" with the "empiriomonist." It turned out to be a deployment of heavy artillery to a part of the battlefield that had largely been vacated. It is significant that Lenin failed to follow it up, as he had his other large works, with a series of special articles in the press. When Bogdanov answered it in a brief defense (the eighty-page pamphlet *Vera i nauka*—"Faith and Science"—Moscow, 1910), Lenin did not even trouble to make a rejoinder.

As Lenin had shrewdly suspected, Lunacharsky did, but Bogda-

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nov did not return to his camp after the tactical and philosophical controversies had blown over. During the war Bogdanov was an internationalist. After the Bolshevik seizure of power in 1917, in which he took no part, he attempted to serve the new society by founding and guiding the Proletcult movement. Driven out of this field by the guardians of "orthodoxy," he returned to the medical laboratory and became the founder and director of the Moscow Institute for Blood Transfusion. In 1928 he died as a consequence of a blood transfusion experiment, which, because of his uncertainty as to the outcome, he performed upon his own person.

Lenin's book against him, though it created no stir when it was first published, did acquire considerable importance in the history of contemporary thought after Lenin came to power, and more particularly after Lenin's death. Then it was published in huge editions, translated into many tongues, studied and cited by zealous disciples all over the world. In Russia it was made a basic text in the training of all intellectuals and Party theoreticians. As Lenin had used Engels, so now the Leninists used Lenin: as a sword to slay the lurking dragon of "fideism"; as a "quotational shock treatment and chain reaction" to link up and overwhelm all opposition, dissent or independent speculation; as a thread to guide the faithful through the labyrinth of modern science and philosophy. It has been used as a reagent to test new doctrines in such diverse fields as relativity, psychoanalysis, genetics, electronics, theoretical mathematics. Its exegesis of the philosophical insights of Engels and Marx stands today as a coarsening screen between official Russian Marxist thought and the more flexible, receptive, penetrating thinking of the founders of Marxism. On this exegesis by Lenin has been superimposed an exegesis of the exegesis by Stalin.[2] Thus do commentaries upon commentaries upon texts which have become scriptures continue to grow into a body of official state philosophy. Inevitably, where there is orthodoxy there must be heresy. And where the state enforces the orthodoxy, inevitably there must be the burning of heretical writings and autos-da-fé of the heretics. Not for nothing does purge suggest purification.

Lenin's angry moral tone, dim echo of anathema and excommunication, has become the model for the official polemical style employed in the most subtle fields of abstract thinking and scientific and philosophical discussion. Lacking Lenin's strong intellect and originality, lacking his "weakness" for a Gorky or a Lunacharsky,

[2] Stalin: *Dialectical and Historical Materialism*. First published as Chapter IV of Stalin's *Short History of the Communist Party of the Soviet Union*, and then reprinted as a separate work.

and possessing infinitely more power and zeal to enforce their anathemas and edicts of excommunication, innumerable disciples hurl their fragments of text and torrents of epithet. If we are to accept the aphorism—a little unjust to philosophy—which holds that "philosophy consists in asking questions, sophistry in answering them, and fanaticism in enforcing the answers," then Lenin's work, though intended as a blow against anti-rationalism and religious obscurantism, has been fated to serve a quasi-religious fanaticism of its own: developing into a state philosophy or a state faith, the faith of a state relentless, irreconcilable and omnipotent in "enforcing the answers."

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The result of the description in terms of a wave function and probabilities is Heisenberg's uncertainty principle, which states that, e.g. the position and momentum of a particle cannot both be precisely known at a given moment; the more accurately one of these quantities is known, the less accurately is the other known. This has been interpreted as resulting from the fact, that in determining the position of the particle some means must be used (a light quantum must be reflected from it, etc.) which changes the momentum of the particle in a way not precisely determinable. This would seem to indicate that the micro-world is not susceptible to a precise description in all of its detail.

Many Soviet physicists have made passing remarks that the uncertainty principle is extremely dialectical, that the world is not just sitting, waiting to be known, but that there is an interaction between our measuring instruments and the world which gives the latter a slight 'fuzziness'.

Philosophical formulations of this view have come to grief, however. One such formulation was tried by M. A. Markov in the article mentioned in II. Markov tried to present the physical reality as the phenomenon plus interaction with the measuring device. Thus, the reality appearing to us is not the electron, but the electron plus interaction with, e.g., electric field or other apparatus. This does not mean that the electron or the microworld did not exist before measurement. However, it does mean that in principle we cannot pin down that microworld in all of its detail.

A horde of critics attacked Markov, for Kantianism because of his 'microworld *an sich*', for agnosticism because Markov declared not to know what this microworld was, for idealism accusing Markov of representing reality as only a product of human activity. After this, discussion was broken off, changes were made in the board of editors of *Voprosy Filosofii* and the fight turned to other lines.

Soviet writers, in general, have strongly criticized Bohr's principle of complementarity in addition to the indeterminacy principle (the two are closely related). Bohr's principle states that neither the description of a particle as a particle nor that as a wave is complete in itself, but that these two descriptions are complementary. This principle certainly gives the best description of processes possible in the framework of the most successful theories of contemporary physics. Like Heisenberg's principle, however, it has been loosely used by twentieth-century philosophers and physicists who would be philosophers, to cover a multitude of sins. The principle of complementarity has been applied by Bohr to biological processes and J. R. Oppenheimer in this year's Reith Lectures, on the basis of this principle, suggested that the physiological process and aesthetic feeling accompanying the sensation of seeing a

beautiful object were complementary, and, that the latter may not be reducible to the former. Such suggestions seem to indicate that certain questions lie in principle outside the realm of scientific inquiry. This, of course, runs counter to the views of dialectical materialism.

In an attempt to avoid the difficulties coming from the wave function description, Blokhintsev has introduced a statistical ensemble which he endows with an objective existence. We can illustrate such an ensemble best by a concrete example, a collection of atoms which scatter X-rays. Numerous scattering will determine the positions of the electrons in these atoms. Thus, one can define the square of the wave function (i.e., the probabilities) attached to this statistical ensemble. The ensemble exists, however, before the measurement; in fact, since it is a collection of particles, it is easy for it to have an objective existence, independent of measurement.

Fock[10] sharply criticizes this view by pointing out a number of inconsistencies in the theory, but his only telling blow comes when he asks why construct the ensemble in the first place if the wave function completely describes the probabilities of the ratios in which the systems in the statistical ensemble exists? His other remarks are largely lost because he (incorrectly) lumps Blokhintsev's ensembles with groups of possible measurements propounded by Mandelshtam. (This formulation of Mandelshtam has found little support.)

Fock adopts the point of view of the reality of the quantum state. 'We consider as correct that point of view according to which the wave function reflects the real physical state of the microobject'. Blokhintsev objects, substantiating his objections with a telling example from Einstein, that the wave function in this sense can at best be a record of information and can have no direct physical meaning.

Numerous other attempts have been made by Frenkel, Terletsky, etc., to reformulate parts of quantum theory and field theory. None of these seem to have produced striking successes in the sense of new predictions or of simplification of the old theory.

IV. DISCUSSION

The lines of controversy have been outlined in I–III. An interesting difference to other controversies (the Lysenko controversy in genetics, etc.) has been that an official position on these questions has not been taken. The main lines of controversy have not changed greatly over the past thirty years, nor have the participants changed radically, except that many have dropped out. Although Fock and others could easily be accused of propagating physical laws of Western origin, they are treated with respect and publish many philosophical, as well as physical, articles.

Soviet physics has undoubtedly progressed very greatly in the past thirty years, and without drawing heavily upon foreign scientific and foreign educational interchange, which has made this development much harder. The contributions to physics which have met with success, in the sense of predicting new phenomena, simplifying and extending present theories, have been completely similar in genus to those from the Western world and fall into the same pattern. Radically different results and theories from those in Western physics (continuous spectrum of masses in cosmic rays found by Alikhanian *et al.*, etc.) have fallen into disrepute and are no longer believed in the USSR. Physical theories and physical laws have been international in this period.

Various scientists, such as Blokhintsev, have tried to reformulate theories along lines based on dialectical materialism, or their view of what it is. These formulations seem to us to have been mainly clumsy and to have complicated the description of phenomena. Strangely enough, they are rather reminiscent of the meta-language of the logical positivists, which is to make science more precise, but which complicates it so much that nothing can be done after the meta-language has been introduced.

Detailed requirements that dialectical materialism imposes on physical theories vary from philosopher to philosopher, although certain very general requirements seem to be generally accepted. Any attempt to impose a particular detailed system on physical theories would result in chaos in physics, where arguments from macroscopic concepts, which the philosophers are wont to make, have shown themselves to be completely inadequate in recent years.

G. BROWN

[1] See R. Schlesinger, *Zeitschrift fur Sozialforschung*, Paris-New York, vol. 1939, no. 1-2 for a discussion of the prewar situation.

[2] The relevant quotation from Lenin is: "'Matter is disappearing' means that the limit within which we hitherto have known matter is vanishing and that our knowledge is penetrating deeper; properties of matter are disappearing which formerly seemed absolute, immutable and primary (impenetrability, inertia, mass, etc.) and which are now revealed to be relative and characteristic only of certain states of matter. For the *sole* "property" of matter, with whose recognition philosophical materialism is bound up, is the property of *being an objective reality*, of existing outside our mind." (*Materialism and Empiriocriticism*, p. 317 in vol. XI of *Selected Works*, Lenin's italics).

[3] See *Soviet Studies*, vol. I, 85 (1949) for a summary of the accompanying events.

[4] Ibid., p. 181.

[5] V.F., 1951, no. 2, p. 57.

[6] V.F., 1953, no. 3, p. 199.

[7] M. E. Omelyanovsky, V.F., 1951, no. 2, p. 203.

[8] Fock has done a great deal of original work both in relativity and in quantum mechanics. Some of his work has been used by Soviet philosophers to oppose views introduced by Einstein, especially the view that the earth and sun are equivalent systems of reference, although Fock is still attacked by these people for defending the theory of relativity.

[9] V.F. 1953, no. 1, p. 175.

[10] V.F. 1952, no. 4, p. 170.

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14. THE EXCLUSION OF NEGATIVE CASES

Our exposition of contemporary Soviet philosophic procedure began with the enunciation of a hypothesis which claims that the most marked peculiarities of the procedure employed by contemporary Soviet philosophers can be explained by conceiving that procedure as having a basically hypothetico-deductive structure wherein the stage of hypothesis-formation is considered as having been already completed by the so-called "classics of Marxism-Leninism" and the deductive stage with its consequent verification as that now being effected by the "workers on the ideological front". As a matter of fact the essential element of this theory, namely that the structure of contemporary Soviet philosophic procedure is basically hypothetico-deductive, was originally suggested by the observation of the

[1] This is "revisionism" in its official form.

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prevalence in contemporary Soviet philosophy and, for that matter, in contemporary Soviet society as a whole, of an attitude wherein "Marxism-Leninism" is held to be the only valid philosophy and all which is not "Marxist-Leninist" is simply rejected as erroneous. This we call *exclusion of negative cases*. In order to see how this phenomenon of contemporary Soviet philosophy can be explained by our theory, we must briefly consider the hypothetico-deductive method as employed by contemporary empirical science.

The hypothetico-deductive procedure involves three operations – hypothesis-formation, deduction, verification. The scientist begins with certain facts which are the result of experiment or observation, constructs a hypothesis to explain these facts, draws certain inferences from the hypothesis, verifies the inferences by further experiments or observations. An example is the heliocentric theory of Copernicus which, reduced to its bare essentials, was a hypothesis, based on certain statements concerning the position of the celestial bodies, from which were inferred statements on the future positions of these same stars and planets, which statements were corroborated in subsequent observations. In actual practice the procedure is much more complex but the basic structure of the hypothetico-deductive method remains the same.

In speaking of the *exclusion of negative cases* in contemporary Soviet philosophy, we have in mind the methodological base of the above-mentioned attitude that "Marxism-Leninism" is correct and all other systems of thought are wrong. The contemporary Soviet philosopher proceeds somewhat as follows: from the axioms of "Marxist-Leninist philosophy", which he treats as if they were hypotheses set up by the "classics of Marxism-Leninism", he deduces conclusions, to the "verification" of which he proceeds by observation, usually phenomenal. Up to this point the analogy with the procedure of the scientist is quite close. If the inference he had made corresponds to subsequent observations, then he speaks of "irrefutable proof of the veracity of Marxism-Leninism". If, on the contrary, the inference is not borne out by further observations, then the observations or "facts" are revised or rejected. Instead of revising or rejecting the hypothesis as does the scientist, the contemporary Soviet philosopher revises or rejects the facts. In the preceding sections of this chapter we have tried to show the factors which make it a necessity that the contemporary Soviet philosopher reject the "facts" and retain the "hypotheses". Here we wish

to illustrate the consequences of this exclusion of negative cases for contemporary Soviet outlook in general and for contemporary Soviet philosophy in particular. But to go into detailed consideration of specific instances where the exclusion of negative cases has led to the rejection of such scientifically fruitful hypotheses as the theory of relativity [1] would take us too far afield. For our present purposes it will suffice to pass in review some of the general attitudes of contemporary Soviet philosophers in which the effects of the exclusion of negative cases are clearly visible.

In the first chapter we saw that the contemporary Soviet doctrine on method suffers from an almost complete ignorance of the significant advances which scientific methodology has made in recent years, because the "Marxist dialectical method" is held to be the "sole scientific method" (see *180, 184, 185, 187, 201, 332, 498, 499*). This blotting out of a whole area of science is a natural consequence of conceiving "Marxism-Leninism" as "the law-bound result of *all* the previous development of science, the philosophy of all peoples included" (*470*, italics his t.b.). N. S. Khrushchov expresses somewhat the same line of thought when he says: "Changes in the world will proceed in the direction well described by Marx, Engels and Lenin in their theoretical works. We Communists have deep faith in the triumph of Marxist-Leninist teaching" (*376*). B. G. Kuznecov makes reference to "the fact that outside of our dialectico-materialist world-outlook it is completely impossible (to find) any really progressive and constant movement of socio-political ideas, of philosophic ideas and, in a certain sense, even of theoretical science" (*14*), and M. T. Iovčuk says that it is necessary "to stress the correctness of Marxist philosophy by the results of contemporary science" (*24*). According to the editors of the "Osnovy", "Dialectical Materialism represents the sole scientific philosophy, being based on the solid foundation of all of contemporary science" (*396*), "There is a basically scientific philosophy, the conclusions and methods of knowledge of which are just as scientific and just as incompatible with religion as the findings of physics, chemistry, biology, etc. This philosophy is Dialectical Materialism" (*398*), and "only the ideas of Marxism-Leninism have proved capable of showing the people the path of their real emancipation" (*493*).

The exclusivity of "Marxism-Leninism" finds its counterpart in an absolute dichotomy whereby everything which is not "Marxist-Leninist" is to be

[1] See S. Müller-Markus: *Einstein und die Sowjetphilosophie*. (Sovietica Abhandlungen 1) Dordrecht. 1960.

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rejected. N. S. Khrushchov recently said: "In advocating peaceful coexistence, we, of course, have no intention of saying that there are no contradictions between socialism and capitalism, that complete 'harmony' can be established between them, or that it is possible to reconcile the Communist and bourgeois ideologies. Such a viewpoint would be tantamount to retreating from Marxism-Leninism. The ideological differences are irreconcilable and will continue so" (*378*). In the same spirit the editors of "Kommunist" say that "between the bourgeois and proletarian world-outlooks there are not and are not able to be any compromises" (*494*). M. B. Mitin's "The most important phenomenon of our time, a fact of world-wide historical importance, is the rupture of the world into two systems, socialist and capitalist" (*351*) finds its philosophic analogon in "The history of philosophy from antiquity to the present is the history of the conflict of materialism and idealism" (*394*) of the "Osnovy", as well as in the numerous texts which we used in the second chapter (see *178, 315, 330, 381, 393, 469*, etc.). A. I. Vladimirova says: "Two fundamental ideologies fight today for the right of dominating intellects. The ideologies of destruction, death and ruin and the ideologies of life, creation, work and construction. The theoretical analogon of the ideologies of death, is the idea of the end, of completed development, of disappearance, of the cessation of development. The ideologies proclaiming the right of life and creativity operate on the dialectico-materialist theory of unending development and constant motion" (*339*). To which we might add M. T. Iovčuk's "The duty of Soviet historians of philosophy is to blast the slanderous fictions of G. Wetter, Bocheński, M. Lange and other enemies of Marxism" (*344*). In the lead-article of the "Kommunist" of December of 1959 we find a rather long passage which in a way sums up the entire contemporary Soviet attitude. The article is entitled "Time Works for Communism" and the passage reads in translation: "The two worlds – socialist and capitalist – reveal themselves well enough in their relationship to time. With our relationship to it is bound up a great and beautiful dream – the dream of Communism. We look forward with trust, confident in the knowledge that every year brings mankind closer to that beautiful future, which is even now being brought to life in hundreds and thousands of achievements – significant and insignificant, heroic and prosaic. In the capitalist world totally different perspectives are tied up with the inevitable march of time, with the future. In spite of the bureaucratic optimism of the official declarations, it is obvi-

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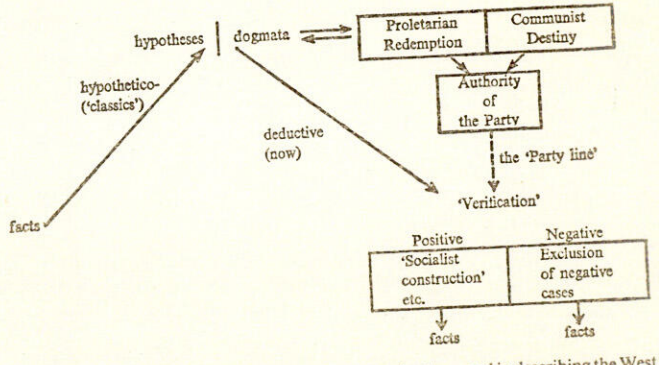
ous that there one has stopped looking to tomorrow with trust or even with hope. The best proof of this is the entire life of contemporary bourgeois society, its ideology and culture, saturated with the disjointing spirit of pessimism, with the foreboding of further decay, with the expectation of new catastrophes" (*495*).[1] The "coexistence" theme current in contemporary Soviet socio-philosophic literature has generated an undercurrent whose aim is to stress the incompatibility of "Marxism-Leninism" with "bourgeois ideologies" in order to prevent any sort of "ideological truce". Almost every recent (1959) issue of "Voprosy filosofii" and "Kommunist" carries one or more articles whose main theme is nothing more than a commentary on Khrushchov's "the ideological differences are irreconcilable and will continue so" (*378*).

Thus, contemporary Soviet philosophers hold "Marxism-Leninism" to be the only valid philosophy and reject all others as erroneous. Or, to put it in terms with which we are by now familiar, the contemporary Soviet philosopher by *meta-dogmatic verification* accepts all events and theories which are defined by the Party as genuine, that is in line with the "historical mission of the proletariat" and the "Communist destiny of mankind", as



[1] It is interesting to note the improvement of the terminology used in describing the West in 1959. Compare the above with B. M. Kedrov's remark in 1947: "without exception, contemporary bourgeois philosophy, being the tool of the international imperialist reaction, is a simple garbage dump, a cesspool of all sorts of conceptual refuse, where there is not even a hint of a progressive thought, but only putrefaction, only decay, cadaverous decomposition" (*11*).

"proofs" of the "principles of Marxism-Leninism", and rejects or revises all events and theories which do not conform or are contrary to these three conditions.

A detailed explanation of the above (p. 69) schema, which includes the essential elements of contemporary Soviet philosophic procedure, as we see it, arranged according to the basic hypothetico-deductive structure, will serve as conclusion to this chapter.

In addition to the three steps involved in any hypothetico-deductive procedure, i.e. hypothesis-formation, deduction, verification, (contemporary) "Soviet method" is governed by a set of extra-methodological postulates which can be resumed in the term "Party line". Therefore, our account will be complete if we give a brief characterization of the essential elements of the three stages and the extra-methodological postulates, as we have found them in contemporary Soviet philosophy.

The hypothesis-formation stage, considered as having been accomplished by the "classics of Marxism-Leninism", consists of an induction from certain facts to certain hypotheses. The facts are those of late 19th (Marx and Engels) and early 20th (Lenin) century science, sociology, philosophy, etc. The hypotheses are the "principles of Marxist philosophy". The fact that contemporary Soviet philosophers conceive "Marxism-Leninism" as a science which *generalizes* and *predicts* and as the "doctrine of the classics" indicates that they conceive the work of the so-called "classics of Marxism-Leninism" *as if* it had been closely analogous to the hypothetico-deductive work of the empirical or natural sciences.

The deductive stage, conceived as that now being carried out by "workers on the ideological front", consists in inference from the "principles of Marxism-Leninism" of conclusions which are "verified" by correlation with subsequent observational data. But the "principles of Marxism-Leninism" are not simple axioms of deduction, they are *dogmatic axioms*; and the "verification" is not a simple correlation with observational data but a correlation with *meta-dogmatically selected data*.

The *primordial act of faith* of the contemporary Soviet philosopher is the acceptance of the "proletarian redemption" and the "Communist destiny". This act, in itself, accounts for the *dogmatizing* of the pronouncements of the so-called "classics" since the certainty of their major conclusions [1] ("proletarian redemption" and "Communist destiny") insures the certainty of the pronouncements which underlie them.

[1] See Section 10.

A *secondary act of faith*, distinct but derived from the first, is the acceptance by the contemporary Soviet philosopher of the authority of the Party in ideological matters. Founded in the meta-dogmata ("proletarian redemption" and "Communist destiny"), the acceptance of the authority of the Party results in the establishment of the "Party line" as principle of selection with the aid of which is determined the "verification" in every particular case.

The "verification" is a *meta-dogmatic verification*. The positive cases, those which show the "principles of Marxism-Leninism" to be realized in "socialist construction" or to be confirmed by the advances of contemporary science, are accepted as proof of the "truth-value of Marxism-Leninism". The negative cases (be they the work of contemporary Soviet philosophers, "revisionists" or "bourgeois ideologists"), those which are at variance with the "official" interpretation of "Marxism-Leninism", result in a rejection of the facts or theories as erroneous ("idealist") or their revision in a "Marxist-Leninist" direction.

As in any attempt to outline the essentials of a process, our diagram simplifies a procedure which is in reality very complex. But it seems that it contains all the elements basic to an investigation and explanation of the other characteristics which are peculiar to contemporary Soviet philosophy. Thus, "party-mindedness" *(partijnost')* is a consequence, not the cause, of the *dogmatic attitude* of contemporary Soviet philosophers. And the *exegetic character* of a large majority of contemporary Soviet philosophic literature is seen to be a natural consequence of the *meta-dogmatic* assumptions which can exist only in function of an authority. Finally, the *unity of theory and practice* which is a dominant theme of contemporary Soviet philosophy is an involuntary exteriorization of the *unity of dogmatism and empirical verification*. Such are the directions in which, it seems, the working hypothesis which we have elaborated could prove fruitful in the investigation of contemporary Soviet phenomena.

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N. 14

THE LETTER ON LYSENKO

The letter and *Pravda's* comment on it which are translated below were published in that newspaper on March 26, 1954, following on Khrushchev's criticism of Dmitriev and of the protection offered to him by Lysenko, which was published in *Pravda* on March 21.

This letter and the political support leading to a change of mind by the Higher Diploma Commission should be treated with caution: they do not amount to evidence of a return to the situation before the famous Lysenko conference of 1948. That conference marked a new stage in the natural sciences as practised in the USSR. The manner and the matter of the new stage should not be confused. The importance of the present document does not go beyond the manner.

J. M.

Letter to the Editor

ON A DEFECTIVE DISSERTATION

Allow me, an old professor who has given his whole life to the service of science, to report a disgraceful occurrence which debases the honour and dignity of our Soviet science. The affair is as follows.

A few months ago, the Higher Diploma Commission sent me for criticism a dissertation by a candidate for doctorate at the Genetics Institute of the USSR Academy of Sciences, Comrade V. S. Dmitriev, 'On the Primary Sources of Origin of some Types of Weeds'. The basic idea of this dissertation consists in an assertion that cultivated plants themselves generate (*porozhdayut*) their own weeds. Thus, rye is presumed to generate rye grass, oats wild oats, sunflower sunflower broomrape, and so forth.

After thorough perusal of this dissertation, I came to the conclusion that it was unfounded in science and unsound in method. For this reason I made an unfavourable report on this work and sent it to the Higher Diploma Commission. The doctoral candidate Comrade Dmitriev was invited to attend a session of the specialist commission for biology of the Higher Diploma Commission. He failed to give satisfactory answers to questions put to him by members of the specialist commission concerning the method of arranging experiments. Moreover, the candidate displayed a poor knowledge of elementary biological laws. This is quite comprehensible, since V. S. Dmitriev, who is a Candidate of Economic Sciences [the first research degree in economics], has not made a thorough study of biology.

As a result of two discussions, the members of the specialist commission formed an unfavourable impression of V. S. Dmitriev's dissertation.

In an effort to mitigate the position, the commission resolved that the dissertation be returned to its author for further work, although there was every justification for outright rejection of this piece of research as obviously erroneous.

A session of the praesidium of the Higher Diploma Commission was held under the chairmanship of Academician A. A. Blagonravov on February

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13. After examining all the materials on the individual case of V. S. Dmitriev, the praesidium recommended the plenary session of the Higher Diploma Commission to reject an application from the Council of the Genetics Institute of the USSR Academy of Sciences that V. S. Dmitriev be confirmed in the degree of Doctor of Biological Sciences.

The plenary session of the Higher Diploma Commission met on February 20th and was attended, among other members, by Academician T. D. Lysenko, the director of V. S. Dmitriev's doctoral studies.

Speaking three times at the plenary session, T. D. Lysenko took V. S. Dmitriev's dissertation under his protection. In doing so Academician Lysenko, with the sharpness characteristic of him, labelled as Weismannist all the referees who had given negative reports on the dissertation, including myself. Academician Lysenko peremptorily declared that he accepted full responsibility for the scientific quality of V. S. Dmitriev's dissertation, without however adducing any proofs in support of his arguments.

T. D. Lysenko's speeches were supported by Academician A. I. Oparin and Members of the 'V. I. Lenin' all-Union Academy of Agricultural Sciences V. P. Bushinsky, P. N. Yakovlev and several others. The statements made by these scientists were of a general declaratory nature, which is quite comprehensible since none of them is a specialist in botany.

Despite the complete methodological and scientific unsoundness of V. S. Dmitriev's dissertation, the plenary session of the Higher Diploma Commission decided to confer upon him the degree of Doctor of Biological Sciences. Sad as it is, this fact in itself testifies to the abnormal state of affairs in our biological science.

I am a non-party person, but I am used to seeing in our party the embodiment of fairness (*spravedlivost*). It is my profound hope that this time too, fairness will triumph. After all, the facts I have reported in this letter cannot but be considered as a mockery of Soviet science.

S. STANKOV, Professor of the 'M. V. Lomonosov' Moscow State University, Doctor of Biological Sciences.

Editorial Note:

The question of Comrade Dmitriev's dissertation was discussed again at a plenary session of the Higher Diploma Commission, after the Commission had received further materials setting out (*kharakterizuyushchikh*) the scientific baselessness and incorrect method of research in this dissertation. Taking into account the further materials on V. S. Dmitriev's work, the Higher Diploma Commission cancelled its decision of February 20, 1954, and resolved to reject the application from the Council of the Genetics Institute of the USSR Academy of Sciences for confirmation of V. S. Dmitriev in the degree of Doctor of Biological Sciences.

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Miscellany

N. 15

(Feuilleton)—PADDING THE SUN. (By E. Parkhomovsky. Izvestia, March 17, p. 3. 1,000 words. Condensed text:) He was a high official of the solar system. This system included several planets of various kinds. But Karimov was drawn to only one of them. The earth's gravity had him chained firmly and for a long time to the Alma-Ata Corona Observation Station of the Kazakh Republic Academy of Sciences' Astrophysics Institute.

The tasks of the station included direct observation of the sun. Karimov's duties consisted in directing these observations. ...

The first enthusiastic opinion on the scientific data obtained by the Alma-Ata Corona Observation Station was expressed by the comrades in Kislovodsk. Their attention was attracted by the marvelous fact that the information Karimov had drawn from the sky in the first half of each month coincided with their own, while that of the second half was substantially different. Therein lay an exciting scientific riddle. It seemed the Alma-Ata Observatory was on the threshold of a great astronomical discovery.

This assumption was confirmed by reports from other observatories. All their attempts to obtain in the latter half of the months solar measurements even approximately equal to Karimov's ended in failure. ...

The first session of the U.S.S.R. Academy of Sciences' Astronomy Council devoted to Karimov's life and activity was extremely stormy. After passionate debates, it was decided to send an authoritative commission to Alma-Ata.

The results of the commission's work exceeded the boldest expectations. They amounted to a scientific discovery of the first magnitude. It was learned that, in a desire to distinguish himself at all costs and "to take the first place in the world in the quantity and quality of solar observation," Karimov had embarked on a path of report padding and hoodwinking. ...

Considering that the end justifies the means, the Director of the Alma-Ata Corona Observation Station artificially added to the number of days for the observation of the sun's corona. He entered in his records days on which the state of the earth's atmosphere makes observation as impossible as cooking a stew with sunbeams. Taking his data from the ceiling, or rather, from a sky covered with small clouds, Karimov made all kinds of guesses just to have something to put in his records. The reports had to be sent at the end of every month to the Kislovodsk Astronomy Center. By that time, sun bulletins for the first half of the month had arrived from Kislovodsk. The simplest thing was to tally the data off the ceiling with these bulletins and to send them back to Kislovodsk. But what should one do about data for the second half? In view of the neglected state of the apparatus and the fake "observation days," they had to be composed by guess. And this was done. The poor astrophysicists of Kislovodsk and their colleagues at other observatories

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racked their brains trying to decipher the nature of Karimov's "anomalies."

The conclusions of the commission, confirmed by the presidium of the astronomy council, were reported to the plenary session of the astronomy council in Leningrad. The public was not seized with envy. The public gasped. Holding their breath, scientists expressed surprise at the fact that the Presidium of the Kazakh Republic Academy of Sciences had not taken the most resolute measures of punishment with respect to Karimov. Considering that the falsifier Karimov should not hold the degree of candidate of sciences, they asked the Higher Accreditation Commission that he be deprived of this degree.

All this is written in black and white in the official decision of the Jan. 18, 1963, plenary session of the astronomy council.

However, in Alma-Ata nobody is in a hurry to dismiss and punish the cosmic hoodwinker. After the Presidium of the Kazakh Republic Academy of Sciences was officially informed of the conclusions of the astronomy council's commission, Takibayev, Vice-President of the Academy, went to the Astrophysics Institute on the Kamenskoye Plateau.

The negotiations on the plateau proceeded in an atmosphere of complete mutual misunderstanding. Of course, the high-ranking guest said, your Karimov is no world-beater. But I would not attach too much importance to his mistakes. This is no time for that. Today people must be treated sensitively and solicitously. In brief, there can be no question of firing. And if you try to convene the learned council and arrange a vote on this matter, I shall disperse you all! Understand? ...

It is impossible to believe, after all, that members of the Presidium of the Kazakh Republic Academy of Sciences are intimidated by Karimov's boast that he is a relative of a high official of the republic and that, if anything is done to him, he can simply have the Academy here closed. It must be assumed that this official himself knows nothing about this boast.

However that may be, Karimov's star is kept on in the Alma-Ata firmament by some laws of celestial mechanics that have not yet been studied. At the astronomy council they continue to rack their brains over this riddle. The possibility that we are on the threshold of a new discovery cannot be ruled out.

(Feuilleton)—IN CUSTODY OF SCIENCE. (By F. Breus and Kh. Karzhaubayev. Pravda, March 18, p. 4. Complete text:) Alma-Ata—In the 45th year of his life A. A. Loshakov decided to part company with economic activity and devote himself to science. He crossed the distance from practice to theory in a rush, because the Aktyubinsk militia was on Alexander Andreyevich's trail. To save himself from capture, he vanished into an animal husbandry research institute and started, while on the run, to compose a dissertation on sheep.

But the investigators picked up his traces. They were most interested in Loshakov's activity in the post of farm director, from which he had rushed into science. Alexander Andreyevich had been tempestuously active on this farm. He had sold his friends rams at a reduced price. He had authenticated fictitious documents concerning the slaughter of livestock: The receipts went to the state and the steers were sold on the side. He had traded 26 tons of wheat, 32 tons of oats and four tons of millet for his personal house.

When Loshakov's case had grown to the size of a dissertation, the investigators turned him over to the people's court. But the judges evidently realized that the man standing before them was not a larcenous manager but a noble man of science. Loshakov received two years of probation for all his dealings and was sent for rehabilitation to the research institute!

Here we are bound to cast a shadow on the animal husbandry scientists. When it comes to rehabilitating sharp dealers, they did not invent the notion of taking them into custody. This idea was long ago put into practice by other research institutes in the republic and by the Kazakh State University.

In Karaganda, M. Kasimov was removed from his job as manager of the province office of the State Bank, and a suitable post was sought for him, though without special enthusiasm. Suddenly there came a call from Kazakh State University: "Assign Kasimov to Alma-Ata at once. He has acceded through competition to the post of instructor in the economics faculty."

"Through competition!" they exclaimed in Karaganda. "What did he submit there, we'd like to know? His reprimand for bribetaking or his reprimand for forging documents? Or perhaps Kasimov sent Alma-Ata the order on his dismissal from the bank as an unfit official."

The Karagandans shook their heads in bewilderment:

"And was not the request itself forged?"

No, the request proved to be real. What was forged was the competition. Actually, there had been no competition at all. The heads of the university were simply ashamed to admit that they were taking Kasimov into custody. An awkward situation! The economics faculty already had one such person in its collective custody, T. Tulebayev, who had been dismissed from the Postal Ministry at the insistence of the Party organization. True, Tulebayev was not teaching at the university now. The storm had blown over, and they had managed to install him, an historian by vocation, as director of the republic State Planning Committee's economics research institute. But the same faculty had M. Ye. Butin, who is not entirely unknown, heading a department. This was the same Butin who had been removed from a responsible post for speculating in valuables. He had been removed and then handed over into the custody of the university.

"So Kasimov is in custody? Whose? Butin's?"

The chicanery about the competition all came to light. But Kasimov was already at the university, working on a dissertation. The pay of a rank-and-file instructor did not suit Kasimov. Candidates of sciences, he reasoned, get more. For this a dissertation has to be defended. And when would this come to pass? It was a long wait! And so Kasimov started to make a fuss: "I request that I be made at least a docent."

The learned council turned down Kasimov's solicitations by unanimous vote.

"Listen," the scientists explained to him, "you have no pedagogical experience or scholarly credentials."

"And you listen to me!" the unimpressed Kasimov insisted. "I am accustomed to receiving high pay. And my family is also accustomed to it."

Not only did he take the scientists to task, he also wrote a statement to K. Bilyalov, Minister of Higher and Specialized Secondary Education: "Prior to my arrival at the university, I held a number of managerial posts. I was satisfied both morally and materially. Now I am confronted with a new, vitally important question: How can I go on?"

To put it briefly, Kasimov was presenting an ultimatum: You took me into custody, it said, so feed me with all generosity!

The ministry could only be pleased that Kasimov had a relatively small family. Had his family been any larger, he would have demanded professorial rank. But here the man was asking very little: He wanted to be a docent. Give him his docent rank!

After that, everything went smoothly. Kasimov that same day submitted his application to the ministry, two days later the learned council, "realizing its mistake," unanimously voted "yes," and a day after that a university order appeared, followed by a ministry order.

"Congratulations, colleague!" the department head Butin, who himself had not done badly in custody, said with feeling to the new Docent Kasimov.

And only the frivolous students failed to show any kind of enthusiasm. Despite the fact that there were many people's volunteers among them—public educators, in a manner of speaking—they made no appraisal of this new phenomenon, science being taken into custody.

We do not contend that a stone wall should be put up between science and practice. We favor close friendship between science and practice; we are all for it when a talented collective or state farm agronomist or zootechnician becomes a scientist, or when a recognized scientist, feeling organizational stirrings within himself, goes into production, enriching it with his discoveries.

But we are opposed to someone's furtively tossing into science that which is unfit for practice.

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- PREMIO NOBEL PER LE SCIENZE -

- FISICA -

1958	- P.A. Cerenkov	(U.R.S.S.)	(Ricerche sulle particelle ato-
"	- I.M. Frank	(U.R.S.S.)	miche e i suoi raggi cosmici.)
"	- I.E. Tamm	(U.R.S.S.)	
1962	- L. Landau	(U.R.S.S.)	(Ricerche nella teoria degli stadi solidi e sulle basse temperature.)

- CHIMICA -

1956	- N.N. Semienov	(U.R.S.S.)	(Studi sulle reazioni molecolari)
1959	- J. Heyrovsky	(Cecoslovacchia)	

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FRANK, IL'YA MIKHAILOVICH (Physicist)

I. M. Frank was born October 23, 1908. After graduating in 1930 from Moscow University, he worked in the State Optical Institute. In 1934 he went to work at the Physics Institute of the U.S.S.R. Academy of Sciences. He became a professor in 1944 at Moscow University. Since 1946 he has been a Corresponding Member of the U.S.S.R. Academy of Sciences. He was awarded a Stalin Prize in 1946, and in 1958 the Nobel Prize.

Frank's major work is in physical optics and nuclear physics. Together with the Soviet scientist, I. E. Tamm, he gave the theory of the Cherenkov effect. In cooperation with L. V. Groshev, he studied pair formation. Frank, and his associates, studied the physics of neutrons.

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TAMM, IGOR' EVGEN'EVICH (Physicist)

I. E. Tamm was born July 8, 1895. He graduated from Moscow University in 1918 and then taught at several universities. From 1924 to 1941 and again in 1954, he was at Moscow University. Beginning in 1934, he has worked at the Physics Institute of the U.S.S.R. Academy of Sciences. Tamm was a Corresponding Member of the U.S.S.R. Academy of Sciences from 1933 until 1953 when he was elected an Academician. He was a Hero of Socialist Labor. In 1958 he received a Stalin Prize and also the Nobel Prize. All of Tamm's students are well known physicists and theoreticians.

Tamm's theoretical investigations are in quantum mechanics and its applications, in radiation, in cosmic rays, and interaction of nuclear particles. In 1932 he formulated a quantum theory on the scattering of light in solid bodies and developed the relativistic quantum mechanics theory of light scattering by electrons. In the quantum theory of metals, Tamm and S. P. Shubin gave a theory of the photoeffect in metals in 1931. In 1932 he predicted the existence of special surface states of electrons on crystals known as the Tamm levels. In 1934 he developed mathematically a quantitative theory of nuclear forces based on exchange interaction of electrons and neutrinos. In 1937 he and I. M. Frank worked out the theory of Cherenkov effect, the radiation emitted by a rapidly moving electron. For this work he received the Nobel Prize. In 1945 he gave an approximate method for calculating the interaction of nuclear elementary particles. Tamm, with A. D. Sakharov, proposed in 1950 the utilization of an electric discharge in plasma, which is placed in a magnetic field, for obtaining a controlled thermonuclear reaction. Tamm is the author of a textbook, Basis of the Theory of Electricity (1929, 6th ed., 1956).

Tamm has attended the Pugwash Conferences.

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LANDAU, LEV DAVIDOVICH (Physicist)

L. D. Landau was born January 22, 1908 in Baku. In 1927 he graduated from Leningrad State University. He began working in 1937 at the Institute of Physical Problems of the U.S.S.R. Academy of Sciences. In 1943 he became a professor at Moscow State University. He has been an Academician since 1946. He was awarded a State Prize in 1946, Lenin Prize in 1962, and two Orders of Lenin. In November 1962 Landau was awarded the Nobel Prize in physics. He is a member of numerous foreign scientific organizations including: the National Academy of Sciences of the United States, the English Physical Society, the English Royal Society, the Danish Royal Academy of Sciences, the Dutch Academy of Sciences, and the French Physical Society.

Landau's investigations are in solid state theory and physics of low temperatures. He has worked out a thermodynamic theory of the phase transitions of a secondary kind in solids bodies, and elucidated their profound connection with the qualitative change of a body's symmetry during transition. In 1940-41 Landau developed the macroscopic theory of liquid helium superfluidity which takes place in this fluid at temperatures close to absolute zero. Landau predicted the possibility of diffusing sound waves with two unequal speeds (phenomenon of secondary sound) in liquid helium. In his works on superconductivity, Landau presented a theory on the intermediate condition of superconductors. In conjunction with A. Abrikosov, I. Pomeranchuk and I. Khalatnikov, Landau found a solution to the main equations of the quantum field theory, without the use of the perturbation theory, and he proved that the concept of point interaction is groundless because it leads to the absence of any interaction. Recently, in connection with the discovery of the nonconservation of parity in weak interactions, Landau proposed the theory of combined inversion and the theory of a "two component neutrino." A considerable number of his investigations are in nuclear physics and cosmic rays.

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SEMENOV, NIKOLAI NIKOLAEVICH (Physical Chemist)

N. N. Semenov was born April 15, 1896. In 1917 he gradu ated from Petrograd University. During the years 1920-31, worked at the Leningrad Physico-Technical Institute. He be came Chief of the Institute of Chemical Physics of the U.S.S. Academy of Sciences in 1931 and subsequently the Director. 1928 he was made professor at the Leningrad Polytechnic In tute and in 1944 professor at the Moscow University. He wa a Corresponding Member of the U.S.S.R. Academy of Scienc from 1929 until 1932 when he was elected Academician. In 1 he became a member of the Communist Party of the Soviet Union. He was awarded a Stalin Prize in 1941, and in 1956 th Nobel Prize.

Semenov's first scientific work was in molecular physics and electron phenomena such as: vapor condensation on solid surfaces, the ionization of vapors of salts under the influence of an electron bombardment, and electric breakdown of di- electrics. And he also developed a thermal theory of the di- electric breakdown. The initial assumptions of this theory were utilized by Semenov in his theory of thermal explosions gas mixtures. According to this theory, the cause of the ex- plosion is the unattainment of the heat equilibrium during

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chemical reaction, because the heat liberated does not have time to leave the reaction zone. Semenov and his students studied energy distribution in a flame, detonation, and combustion of explosives and powders. The investigations of Semenov on the theory of chain reactions is particularly significa... On the basis of the study of critical phenomena, such as li... of ignition, observed during oxidation of vapors of phospho... hydrogen, carbon monoxide and other compounds, he disco... branching reactions. In his monograph, "Chain Reactions" (1934), he developed the theory of non-branching reactions... showed the wide distribution of chain reactions in chemistr... He and his associates developed theoretically and checked ... perimentally many ideas of the chain theory: the breaking... reaction chains on walls and in the volume of a container, ... generate chain branching, positive and negative interactio... chains. Also, he established the detailed mechanism in a se... of complex chain processes, and studied the properties of f... atoms and radicals with the aid of which the elementary sta... of these processes were realized. Semenov took active par... in organizing a physico-mechanical department at the Lenin... grad Polytechnic Institute and in starting scientific journals. He trained many specialists in physics, chemical kinetics, a... the combustion theory.

In March 1962, Semenov was elected a delegate from ... R.S.F.S.R. to the Supreme Soviet. As of 1961, he was Secreta... of the Department of Chemical Sciences of the U.S.S.R. Academy of Sciences.

In 1961 he was elected Candidate Member of the Central Committee of the Communist Party.

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