

Genetics in the Soviet Union

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INDEX

	PAGE		PAGE
PART I. INTRODUCTION	411	II.7. General Conclusive Considerations	421
I.1. A Controversial Science	411	II.7.1. Matter of Fact	421
I.2. Lamarckism and Neo-Mendelism	411	II.7.2. Matter of Method	421
I.3. Neo-Lamarckism	412	II.7.3. Matter of Principle	421
PART II. MICHURINISM	413	PART III. OVERCOMING MICHURINISM	423
II.1. The Founders	413	III.1. Introduction: Stalin's Era and the Ab- solute Power	423
II.1.1. Trofim Denisovič Lysenko	413	III.2. The Interregnum	423
II.1.2. Ivan Vladimirovič Mičurin	413	III.3. Chruščëv's Era — A Paradox	424
II.1.3. Kliment Arkadevič Timirjazev	413	III.4. The Management Era	424
II.1.4. Others	414	III.4.1. The Restoration	424
II.2. Definition	414	III.4.2. The Present Situation	426
II.3. Synonyms	414	PART IV. GENERAL DISCUSSION AND CONCLUSION	428
II.4. The Theory	414	PART V.	430
II.5. The Application into Practice	415	V.1. Summary	430
II.6. Discussion	417	V.2. Bibliography	430
II.6.1. On the Scientific Ground	417		
II.6.2. The Ideological Background	419		
II.6.3. The Political Background	419		
II.6.4. The Socio-Economic Background	420		

NOTICE

The present essay is meant as a contribution to the study of the widely expanded controversy on Michurinism and as a tool of information on the present status of Genetics in the Soviet Union. It is in no way a complete review. For the few aspects emphasized, many others have hardly, if at all, been dealt with. The controversy has been actually examined with special reference to its background and overall implications, as well as to recent developments, which throw new light on past events and open new perspectives for the future of Genetics in the Soviet Union.

A detailed account of the nature of the controversy, as it appeared in 1948, may be found in J. Huxley's largely known classic: "Soviet Genetics and World Science", London, 1949 - to which the A. is largely indebted.

However, after the 1948-1949 explosion of papers, comparatively little was written on the genetic controversy, notwithstanding important changes in its course, such as Lysenko's decline and the re-emergence of neo-Mendelian Genetics.

This was the main reason which led to the present essay.

The collection of bibliographic material took, however, a rather long time, and eventually resulted to be largely incomplete.

In the meantime, a number of new papers have been published on the matter: only a few of them could be taken into account in the text, while many others were received too late, or not at all. In particular, the following two should be mentioned:

JORAVSKY D. (1965). La sconfitta del Lysenkismo (*It. transl.*). In: *Cultura e Ideologia nell'URSS. L'Est*, 30 dicembre: 13-35.

(A general essay on the nature, background and present status of Lysenkoism. Joravsky, who is a member of the Russian Research Center, Harvard University, is also preparing a monograph on the Lysenko affair).

SWAMINATHAN M. S. (1966). Genetics today in the USSR. *J. Sci. Industr. Res.*, 25, 4: 151-156.

(An account of the present status of research in the main genetic centers in the Soviet Union).

PART I
INTRODUCTION

I.1. A Controversial Science

In the course of its relatively short life, Genetics has more than once been the object of a widely expanded controversy.

The old assumption of the “natural superiority” that certain families, groups and/or populations would possess with respect to others, mixed-up with a rather particular interpretation of the principles of Genetics, produced, in the early thirties, a “*Scientific Racism*”, to support and enhance “Race” discrimination. The enunciation of such principles gave rise to a wide controversy in the scientific world; their dramatic application relegated the scientific question to a very secondary one. Thereafter, the terrible experience over, the scientific controversy appeared to be clearly overcome, while hardly the same could be said of racism, under its various forms.

In the meantime, a profound revolution had been taking place in the Soviet Union, in the realm of biological sciences. Once more, Genetics was involved in a controversy; only, this time, its very bases had become the object of discussion, as well as the fundamentals of any scientific knowledge.

I.2. Lamarckism and Neo-Mendelism

What has been called “A Revolution in Soviet Science” (Darlington, 1947), was mainly based on the largely known, old theory of the *inheritance of acquired characters* (modifications) — frequently considered as Lamarck’s fundamental theory, and generally referred to as “Lamarckism”.

Actually, Lamarck (1744-1820) had proposed the much more fundamental theory of evolution (Lamarck, 1809), in which the inheritance of acquired characters was only considered as a possible modality — after all, rather reasonable, at that time — but, at any rate, of secondary importance.

Darwin (1809-1882), a few decades later, while stressing the importance of the rôle played by natural selection in the history of evolution, tentatively, but only partly, agreed on Lamarck’s hypothesis about the inheritance of modifications (Darwin, 1859) — as a result of the almost complete ignorance surrounding, at that time, the basic mechanisms of heredity.

In those very years, in the middle of numberless discussions and debates on Darwinism and Evolution, Mendel (1822-1884) had presented to an uninterested audience, and made available to a still unprepared scientific world, his fundamental principles (Mendel, 1865). A rather strange fate made them remain neglected for 35 years.

It seems to be proved that Darwin never knew about Mendel's discoveries, which is very unfortunate, for he would have probably corrected both Lamarck and himself, thus avoiding so many wrong speculations made in his name.

However, the theory of the inheritance of acquired characters was far from being generally shared. The second half of the nineteenth century was, actually, the witness of a whole series of controversies, involving evolutionists and nonevolutionists, and, among the former, partisans and opponents of the inheritance of acquired characters.

Around the end of the century, Weismann (1834-1914) suggested the fundamental distinction between a *somatoplasm* (Kernplasma) and a *germ plasm* (Keimplasma). The changes to which the former would be subjected, as a result of environmental factors, would never affect the latter, unmodifiable and continuous through the germ line (Weismann, 1892).

The rediscovery of Mendel's Laws, in 1900, and the subsequent, outstanding development of Genetics, by providing a material basis for heredity, and extending it to practically all living organisms, cut off all polemics, definitely relegating the inheritance of acquired characters to ancient beliefs. On the other hand, Weismann's theory too, although probably constituting the best attempt, in the study of heredity of the pre-Mendelian era, soon proved to be elementary, and only held a historical value.

I.3. Neo-Lamarckism

To the great astonishment of most scientists, however, a few decades later, in the Soviet Union, the concept of inheritance of acquired characters started to reappear. This gave rise to a new controversy, which involved, at first, only Soviet geneticists, but became, then, more general, especially in the late forties.

In August, 1948, in a memorable Session of the "Lenin Soviet Academy of Agricultural Sciences", the views of this "Neo-Lamarckism" — exposed by their main proponent, T. D. Lysenko, under the name of *Michurinism* — were practically imposed upon a good deal of Soviet classic geneticists, as the new, official science of Genetics.

PART II

MICHURINISM

II.1. The Founders

II.1.1. TROFIM DENISOVIČ LYSENKO

Born in 1898, in the Ukrainian village of Karlovka, he attended the local Horticultural School, a two-year course on Selection and the Faculty of Agricultural Sciences at the University of Kiev. In the late twenties, he worked out his theories on “Stage-development” and “Vernalization”, which made him rather well known. A few years later, in collaboration with the philosopher Isaak Izrailovič Prezent (b. 1902), he started attacking Neo-Mendelism, claiming it to be anti-Darwinian and idealistic, and, therefore, a “bourgeois pseudo-science”. On the other hand, he celebrated the work of “great Soviet Darwinian scientists”, such as Mičurin and Timirjazev, based on the inheritance of acquired characters. Largely supported and appreciated by political authorities, in 1938 he substituted Vavilov, as the President of the Lenin Soviet Academy of Agricultural Sciences. Then, he was named a “hero” of the Soviet Union and was bestowed the Stalin and Lenin Prizes. He also held, for some time, important political charges. Since Stalin’s death (1953), he gradually declined, and was finally removed from most of his positions.

II.1.2. IVAN VLADIMIROVIČ MIČURIN (1855-1935).

His father being an experienced horticulturist and possessing a little country estate (Veršina, near Dolgoje — thereafter named Mičurinsk), he started, as a child, to become acquainted and to experiment with hybridization problems. His father dead, the estate sold and his studies interrupted, he had to start working. A few years later, however, he succeeded in renting a garden to continue his experiments. Having been especially successful in improving many varieties of fruits, he was, at last, partly supported by the Soviet Government. He believed in the inheritance of acquired characters, but was, actually, interested in very practical things, namely, the improvement of the very poor conditions of Russian horticulture, and did not seem to be very much concerned about the means used, and/or their theoretical interest.

II.1.3. KLIMENT ARKADEVIČ TIMIRJAZEV (1843-1920).

Professor of Botany at the St. Petersburg Agricultural Academy and at the University of Moscow. He was a convinced Darwinian, but, just like Mičurin, was mainly interested in the improvement of agriculture and of the living conditions of the Russian farmer.

II.1.4. OTHERS

Lysenko and his followers also picked up, here and there, a few other names, to support their views, such as those of Lucien Daniel, a French Professor of Botany, Luther Burbank, an American horticulturist; V. R. Williams, the theorist of the unlimited fertility of the ground, and others.

II.2. Definition

The following statements, by which Lysenko defined Michurinism, may help understanding both the spirit and substance of the Soviet reformation:

“Socialist agriculture, the regime of kolkhozes and sovkhoses, have generated a Soviet biological science of their own — Michurinism” which states that “... the inheritance of acquired characters, in plants and in animals, in the process of their evolution, is possible and necessary: Ivan Vladimirovič Mičurin, on the basis of his experimental and practical works, has dominated these possibilities.” (Lysenko, 1948).

II.3. Synonyms

Michurinism has also been referred to in terms of:

i) *Agrobiology*, because of its close relationship to agricultural problems. This term was proposed by Lysenko himself, and replaced, in Soviet terminology, the one of “Genetics” — this latter term being only used preceded by such epithets as “Western”, “reactionary”, “idealistic”, “Morganian-Weismannian”, etc.

ii) *Neo-Lamarckism*, because of its being, fundamentally, a re-statement of Lamarck’s old theory — become, then, famous under the name of Lamarckism.

iii) *Lysenkoism*, Lysenko having actually been the real founder of Michurinism.

iv) *Soviet Genetics*, which clearly indicates its ideological and political background, as well as its limited appeal out of the Soviet area.

II.4. The Theory

Working out the lamarckian principle of the inheritance of acquired characters, Michurinism claims the hereditary fixation of the latter to be possible under “*shattering*” conditions, which would make “heredity” (hereditary constitution) become more “*plastic*”, thus assuming the new character(s) from the environment, or allowing man to introduce it (them), through a suitable “education”. Such character(s) would then become hereditary, and therefore inheritable.

The hereditary constitution of a plant would be shattered in the following ways (Lysenko, 1948):

i) Through *grafting*, i.e. through the union of tissues from plants of different species. (This method is also referred to as *vegetative hybridization*).

ii) Through the *action of environmental conditions in particular moments*, when particular processes of development are taking place in the organism.

iii) Through *hybridization*, especially of forms widely differing both for their habitat and origin.

All three methods, largely employed by Mičurin and others, have been claimed by Lysenko and his school, to have proven largely successful in the agricultural practice, thus providing outstanding evidence for the inheritance of acquired characters.

Apart from formulating Mičurin's empirical principles into theories, and making them being called a Science, Lysenko also contributed the more personal theory of the *stage-development*. According to this theory, the development of a plant would involve different stages, each of them requiring, to be completed, very definite conditions; no new stage could start, until such conditions be not fulfilled for the preceding one. If a modification be produced, just in the course of the stage to be modified, the shattering would be obtained, and the modification would become hereditary.

A practical application of this theory has been the so-called *Vernalization*. The stage analysis having detected a *Thermostage*, or *Stage of Vernalization* (which would be the first one, in the development of a plant), artificial conditions are produced, so that this stage be completed without necessarily waiting for the natural climate conditions. This modification of the organism is claimed to become hereditary.

II.5. The Application into Practice

Much has been written, and by leading authorities, about the way Michurinism was imposed upon Soviet classical geneticists, and then put into practice. Overcoming the numerous difficulties, deriving from the unavailability of official creditable information, T. Dobzhansky, J. Huxley, H. J. Muller and others, combining personal experience with all possible sources of information, succeeded in contributing as far as possible complete accounts of the controversy, such as Huxley's essay "Soviet Genetics and World Science" (1949) — a largely known classic.

The direct witness of an old Soviet biologist is now here reported, by translating some parts from his recent "Notes of Genetics" (Šarov, 1965).

"In the past twenty years, all of us have, more than once, missed the reason of what was happening. ... What has happened in the field of biology, starting with the late thirties, is closely related to the cult of personality, and to the trend — emerged, at that time, also in the Scientific field — to establish a complete uniformity. The task of research workers ... became, first of all, to confirm hypothetical laws ... to confirm, for instance, that V. R. Williams had created 'the theory of the unlimited increase of the ground's fertility'. ... How one must have strived to be blind, to speak of *unlimited* increase of fertility, before what was happening in agriculture! To confirm the new laws on the formation of species, according to which little cuckoo derives from other races' littles, provided the latter are nourished with grubs; oat turns into

dog grass, rye into wheat, fir into pine. ... Hundreds of articles, books were then published ... to demonstrate that geneticists, as the exponents of the bourgeois reactionary science, must be expelled, without pity, out of science and of life. ... The fact that the men condemned by the ostracism were scientists having proved their devotion, and indissolubly linked to the revolution, since the very days of the October, did not stop, nor embarrass these writers”.

Lysenko was growing stronger and stronger. Already in 1938, he had succeeded in being appointed President of the Lenin Soviet Academy of Agricultural Sciences, replacing N. I. Vavilov — a leading botanist and geneticist, highly appreciated in the Soviet Union and abroad (he was one of the very few foreign members of the Royal Society!).

“ In the spring of 1939, Stalin received Nikolaj Ivanovič Vavilov, the great Soviet Botanist. ‘ You are concerned with botany! With genetics! — Stalin kept repeating — You divert the people from the fight for the crops!’ So, the second phase started: geneticists were deprived of the last possibilities of maintaining their views. A few months later, Vavilov went to prison, where he eventually died.” (Šarov, 1965).

Classic geneticists did not surrender and kept fighting. There were, among them, men of great value, such as Nikolaj Petrovič Kol'tsov, Salomon Levit, Iosif Abramovič Rapoport, Ivan Ivanovič Šmal'hausen, Mihail and Boris Mihailovič Zavadovskij, Anton Romanovič Žebrak, and so many others.

But there was little to do, for people who could use nothing, but the force of persuasion, to fight against blind dogmatism and administrative coercion.

So, in 1948, Lysenko's monopoly was officially consecrated in a Session of the Lenin Soviet Academy of Agricultural Sciences, the final resolution of which definitely approved Lysenko's report and condemned neo-Mendelian positions. Stalin and the Party had officially entered the controversy, supported Lysenko and then made sure that Genetics would disappear in the Soviet Union, and that so would geneticists, unless they turned to Lysenkoism, or to other branches of Science.

The controversy had, in the meantime, rapidly expanded abroad. Lysenko's teaching was accepted in Eastern European countries and, later on, in China (cf. Li, 1961).

On the other hand, Western scientists had, long before, been noticing the new trends in Soviet biology. Theodosius Dobzhansky, who — although educated in the Soviet Union — had, already in the late twenties, chosen to work in the United States, followed with great concern the events of genetics in his native country. Herman J. Muller, who, in 1930, had accepted an official invitation, to advise and direct genetic studies in the USSR, left, in 1937, rather disappointed. A few authorities had already dealt with the problem, such as Hudson and Richens (1936), Huxley (1945), Ashby (1946, 1947), Darlington (1947) and others. Then, soon after the August, 1948 Session of the Lenin Soviet Academy of Agricultural Sciences, the controversy exploded abroad, and leading Western scientists sharply condemned

the Soviet position (Ashby, 1948; Muller, 1948; Waddington, 1948, 1949; Cook, 1949; Crane, 1949; Dobzhansky, 1949; Goldschmidt, 1949; Harland, 1949; Hogben, 1949; Stern, 1949; Huxley, 1949, 1950, and many others). Few others, both scientists and nonscientists (such as Samuel Butler and Georges Bernard Shaw) supported Lysenko's views.

Meanwhile, "The August session had not only caused a wave of administrative measures against geneticists, but also an opposite one, of protestation, of support to genetics. ... Much was done, on the part of physicists, chemists, mathematicians, for genetic research to proceed. The subjects suppressed in the plans of central biological institutions revived in the various laboratories of other scientific branches." (Šarov, 1965). The very heart of the banished genetics beat in Siberia, in the surroundings of Novosibirsk, where a true scientific citadel had been founded, in the Biological Institute directed by N. P. Dubinin.

So, notwithstanding the official resolution of the Lenin Soviet Academy of Agricultural Sciences, the controversy was far from being concluded.

II.6. Discussion

The nature of the controversy, which has been rather by and large delineated, was actually manifold. Along with the scientific aspect, it also involved ideological, political and socio-economic factors.

II.6.1. ON THE SCIENTIFIC GROUND

The inheritance of acquired characters could well be claimed by Lamarck to be the very source of change, and be, though tentatively, accepted by Darwin: this must have appeared as a reasonable hypothesis, at that time, when "heredity" meant, by and large, something related with blood. Furthermore, as a matter of fact, the idea of change, by itself, was far more important than any hypothesis about its possible sources. Neo-Mendelism has, since, clearly shown acquired characters to be hardly hereditary. This has been generally considered as a scientific fact, for a long time now.

Lysenko rejected Neo-Mendelism, as a whole, claiming the inheritance of acquired characters to be possible and necessary in the process of evolution. His statements, however, hardly appeared to be supported by real evidence. Neo-Mendelism was rejected for being "idealistic" and "sterile" — a rather untenable accuse for the science having established the *material* basis of heredity, and the development of which has been disclosing revolutionary perspectives in medicine and biology. On the other hand, even if this were true, it would hardly be enough to reject a science.

As far as evolution is concerned, Lysenko did not even take into account the fact that a whole series of studies by Sir Ronald A. Fisher, J. B. S. Haldane, Herman J. Muller, Sewall Wright and others had clearly shown that evolution could hardly be explained in terms of inheritance of acquired characters. This could be wrong, but Lysenko should have proven it, instead of keeping on insisting on such things

as the reactionary character of natural selection. The theory of natural selection may, or may not, be considered as reactionary, according to the different interpretations one gives it; but this does not at all make it be wrong or right, accordingly. As a matter of fact, once the theory of evolution accepted, evidence appears to be much more in favour of a neo-Mendelian interpretation, than of a neo-Lamarckian one.

As for the results Lysenko and his associates claimed to have obtained, and to support their theories, it has always appeared rather hard to accept either the results, or their interpretations, or both (although not necessarily rejecting them), mainly because of the following reasons:

- i) Incomplete description of the plans of experiment;
- ii) Use of mixed stocks;
- iii) Insufficient number of generations taken into account;
- iv) Reject of statistical methods;
- v) Almost complete absence of controls.

As a consequence, as many Western scientists pointed out, most experiments could not be duplicated, having not been sufficiently described. When they could be duplicated, hardly the same results were obtained. A number of them might, however, be accepted, but much better explained in terms of selection than of inheritance of acquired characters, because of the use of mixed stocks.

Zirkle (1951) reported a large number of examples of old descriptions of supposed transmutation ("degenerations") of species: "... Virgil and Pliny told how the farmers planted wheat and barley only to discover that some of the seed suddenly produced wild oats. A grain of oats was reported occurring in an ear of wheat by Thomas Johnson in 1633 and a grain of rye in an ear of barley by Ole Worm in 1655. These records are offered here only for comparison with Lysenko's supposed discovery, as reported this year, of grains of rye occurring in an ear of wheat. ... Many of the supposed instances of degeneration, particularly in flower color, were really instances of Mendelian segregation. ... The discovery of the reappearance of ancestral types in the second hybrid generation was only a matter of time".

As a matter of fact, even "granting that the phenomena mentioned above are true, it is still difficult to see where they would nullify the gene theory of heredity". (Li, 1961).

However, it could be worth better examining some aspects of Lysenko's work, without prejudice. For instance, his stage analysis in the physiological development of an organism might prove interesting for the study of mutation. The «shattering» of the genotype might be interpreted in terms of labile status and increased potentiality of mutation of the cell(s) undergoing a critical physiological stage. In the case of elementary organisms and of the germinal cells of higher ones, the genotype would actually be «shattered», but as a result of the introduction of permanent mutations.

II.6.2. THE IDEOLOGICAL BACKGROUND

Marxism is supposed to be a complete system and to concern, and provide an answer and an explication to, every possible aspect of human and social activity. And it is the task of the Party's Ideological Commission to make sure that every possible aspect of human and social activity be examined in Marxist terms, and be, therefore, explained and accepted or rejected. It is, then, the task of the political power to make sure that what has been theoretically rejected, be practically rejected as well. It may happen, of course, that the alarm cry be given by zealous or interested persons, in which case the reaction is, generally, proportional to the importance of the persons involved, and of the matter itself.

Science holds a place of honour in the Marxist system; this especially applies to Biological Sciences, which is witnessed by the interest and appreciation Marx himself showed in Darwin's work¹, and by the celebration of Darwinism — although mutilated of natural selection — subsequently made in the Soviet Union and by all Marxists.

However, while history, philosophy and the social sciences in general could be visualized under completely new terms, the same could hardly apply to pure sciences. In the latter field, therefore, a trend was noticed to argue on conclusions — possibly drawing, and/or supporting, the ones which would better fit Marxist ideology — and to stress, and sometimes exaggerate, the importance of Russian and Soviet contributions to the various branches of science.

In the field of genetics, this was clearly reflected by the numberless statements stigmatising a supposed sterility of Neo-Mendelism — usually referred to as mystic, reactionary, metaphysical, idealistic and anti-Darwinian doctrine, as opposed to the sound, dialectical materialistic and Darwinian doctrine of Michurinism.

This is also easy to realize, when one thinks of the utmost importance ascribed by Marxism to environment and education. The principle according to which it is not conscience that determines man's life, but life that determines man's conscience, is a most fundamental one, in Marxist ideology, arbitrarily considered as a general law, and, in a period of blind dogmatism, pushed to its extreme consequences.

So — Makarenko having outlined the principles of communist education, the prerequisites of a good “*Komsomol*” being taught in Party Schools, the rest of the population being largely conditioned by official propaganda — Lysenko was encouraged and supported in his fight for extending the supremacy of environment and “educational factors” to the realm of biological sciences.

II.6.3. THE POLITICAL BACKGROUND

The very existence of the Soviet Union has been largely influenced by a deeply felt sense of competition. Stalin's doctrine of “Socialism in a single country” required, on one hand, the guaranties of military and economic power, for the USSR

¹ Actually, Marx had expressed to Darwin the wish of dedicating to him “*The Capital*” (1867), but the latter diplomatically declined the invitation.

to be respected and selfstanding, and, on the other, spectacular realizations and successes, for propaganda purposes.

The policy of polemic isolationism and self-sufficiency naturally led to rejecting the bulk of “Western civilization” — most aspects of which would, at any rate, be hardly compatible with the new philosophical, political, economic and social system, and especially with the different standard of life. “Western” thus started to be considered as an injurious epithet, just like “reactionary”, “idealistic”, “imperialistic” and many such terms, used only invectively.

In the scientific field, just like in other ones, the tendency to stress and magnify Russian and Soviet contributions led, sometimes, to exaggerate, misinterpret and distort pure evidence.

So — when the possibility seemed to occur, to substitute a supposed idealistic Genetics, founded by an *Austrian monk*, with an equally supposed materialistic Agrobiology, founded by a *Soviet experimental worker* — Soviet politicians did not hesitate in definitely supporting the latter, notwithstanding what the true facts were.

II.6.4. THE SOCIO-ECONOMIC BACKGROUND

Tsars' Russia was certainly far from possessing a florid economy, and the situation had been growing worse and worse, since the very beginning of the century. From the Russian-Japanese War, in 1905, up to World War I, the regime had been collecting a whole series of political and economic disasters, which culminated in the 1917 collapse and the overthrow of Tsarism. The ensuing revolutionary years, marked by civil war and the economic policy of the so-called “War Communism”, sunk the country down to the very bottom of the '21 famine. A new economic policy (NEP) was immediately approved, thanks to which the situation could be overcome. However, a few years later (1928-1929), NEP was abolished: the new period of economic planning and intensive industrialization was being started. The numberless problems related to agricultural collectivization and the prominent importance given to industrialization, summed up to the pre-existent situation, rapidly resulted in a very unbalanced economy, characterized by the disharmonious development of an ever growing industry, on one hand, and of an always lagging agriculture, on the other.

Under these conditions, Mičurin's experiments had all the more to be followed with the utmost interest, for they seemed to promise just what the country was looking for, namely, rapid improvement and increase of production in agriculture. Lysenko was more definitely supported because of his generalizations and theorizations, and because of his many promises, based on a few preliminary experiments considered to be encouraging. All the more so, when, World War II over, the Soviet Union had to face the problem of reconstruction. The need of immediate practical results was considered incompatible with “traditional” scientific research: in his 1948 report, Lysenko ridiculed Dubinin's interesting studies of natural selection in *Drosophila* during the war, and concluded by stating: “... such are the perspectives of the Morganian ‘science’ for the period of reconstruction!”.

II.7. General Conclusive Considerations

The Soviet experience of Michurinism leads to a few general considerations, which shall be tentatively summarized under three main points, in order of increasing importance.

II.7.1. MATTER OF FACT

Evidence, already in the early twenties, and all the more so at present, has clearly shown the possibilities of inheritance of acquired characters to be practically null. Evolution appears to be only understandable on a neo-Mendelian basis, and it is reasonably certain that, in its course, the inheritance of acquired characters has played little rôle, if any.

On the other hand, as it has already been pointed out (cf. II.6.1.), Lysenko and his School, notwithstanding large means and long time, numberless experiments and the application of their principles on very large scale, failed to provide not only creditable scientific results, but empirical advances, as well. Quite to the contrary, they practically made Soviet agriculture be lagging more than ever and Soviet biology be discredited, until Lysenko's destitution (cf. III.5.1.).

II.7.2. MATTER OF METHOD

Most statements Lysenko and his School have made do not rest on experimental data. Most of their experiments could not be duplicated by other scientists; when they could, most of them failed to produce the same results.

The rigorous procedure of the experimental method being generally ignored, the material being biased, statistical analysis being lacking, the data being often incomplete, Lysenko's works may not be held valid — and their results be discussed upon — until duly duplicated.

II.7.3. MATTER OF PRINCIPLE

This involves the very nature of Science and its relationship with Society and with State, and shall be tentatively formulated under the form of three successive questions.

A – Question One: *Does Society have the right to interfere in scientific matters? If so, what the limits of this right?*

Science is a part of human activity, and, mainly, a social one. Its activity has to be made possible by Society, and has, eventually, to be useful to it. So, a Society has, generally, the right of asking its scientists to work primarily towards particular ends, and of establishing a priority of aims, with respect to its very needs. Under certain circumstances, it might also impose not to follow a particular pattern of research and/or follow some other, because of political, social and/or economic reasons. All this is, more or less, being done in most countries.

B – Question Two: *Does Society have the right to interpret scientific matters?*

Society being formed by a number of individuals, any of them having, of course, his own right of interpretation — in scientific matters, as well as in anything else — it could be inferred that, as a result, Society does have this right. However, one has to consider that:

i) Society is not the result of a mere sum of individuals: our understanding of Society is rather in terms of a whole body, based on organization — therefore *specialization* and *competence* — and common purposes.

ii) The more common interpretation does not necessarily correspond to the right one; all the more so, when on the scientific ground. Facts are not subject to choice.

iii) A “social interpretation” is necessarily expressed and, therefore, leads to consequences involving society as a whole.

Therefore, if such a thing as a “social interpretation” has to exist, it may only be expressed by the individual, or group of individuals, *competent* to do so, as a result of *specialization* within the society.

In the case of Soviet Genetics, this right of interpretation has been expressed through a political organ, namely, the Communist Party (cf. Lysenko, 1948) — possibly the expression of a majority, but hardly competent to do so.

C – Question Three: *Does a political organ (having deprived Society of its right of interpretation, or to which Society has alienated it) have the right to express judgement and condemnation, of and exerting political pressures and coercion on scientific matters?*

Any judgement and possible condemnation are to be expressed by competent organs, and to be based on sound facts. No political organ, as such, may be held competent to judge of scientific matters. No scientific tendency — be it wrong or right — may be acted upon with political pressures and coercion.

In the Soviet Union, the right of interpretation was devolved to the Communist Party; the latter judged a strictly scientific question: due to incompetence, misunderstood convenience and prejudice, it ignored, misinterpreted and distorted *facts*; in so doing, it condemned the right and approved the wrong; eventually, it used its power to have its decisions prevail. Legalized violence and moral and material coercion were introduced in a scientific controversy.

In the above facts lays the very fundamental question, for they clearly witness a reject of the principles underlying the scientific method.

All this could not help entailing, at long last, those very effects that responsible scientists had, long before, foreseen:

“If the facts are distorted for political purposes, if science is misused to please those in power, the result can only be failure and finally collapse. ... What Lysenko and his group prepare will become disastrous for Russian science. An agriculture, an economy based upon distortion of facts will become a failure. Science means adaptation to facts.” (Iltis, 1951).

PART III

OVERCOMING MICHURINISM

III.1. Introduction: Stalin's Era and the Absolute Power

It is in this period that the genetic controversy exploded, to be then conducted on a political and administrative plan. Why and how this happened, has already been tentatively explained in Part II of the present article. The support Lysenko received from the Party, and from Stalin himself, attained its utmost expression in the 1948 Session of the Lenin Soviet Academy of Agricultural Sciences. On that occasion, he could cut short all discussions by simply stating: "The Central Committee has examined my report and approved it".

Only a very strong political support could let Lysenko and his associates make unconceivable statements, such as: "Morganians invite us to discussion, but we shall never discuss with them; we shall keep on denouncing them, as the representatives of a harmful and ideologically strange tendency, imported in our country from abroad." (Prezent, 1948).

And this is exactly what they did: they denounced the internal "morganians" to the political power — which condemned them to a moral, and/or material disappearance — and did not accept the discussion with the external ones. So, in relatively little time, the controversy practically died, for lack of alimentation on the internal front, and being ignored on the external one.

III.2. The Interregnum

Yet, neo-Mendelian genetics could disguise it-self and, as Stalin died, in 1953, it rapidly revived.

The political situation had turned uncertain and unstable: Stalin's death had been rather sudden, and a great many heirs were still involved in the fight for succession. Lysenko had lost his main support, and there was now little time in the Party to think of genetics.

The favourable situation having been noticed, a second round of the controversy could be started. Only, this time, it was bound to the national territory, and, mainly, to the scientific ground.

The Editorial Staff of a highly specialized Journal, the "Botaničeskij Žurnal", entirely devoted itself to a serious criticism of Lysenko's theories and monopoly, while re-evaluating the importance of classic genetics and the fundamental contributions of Soviet neo-Mendelian scientists.

Being held on a strictly scientific ground, practically limited to the pages of the two Journals — "Botaničeskij Žurnal", on one side, and Lysenko's "Agrobiologija",

on the other — anxiously followed by the scientific world, but free from outer interferences, this second round of the genetic controversy was rapidly turning in favour of the “Botaničeskij Žurnal”. Then, something new happened, which made all hopes be frustrated and vanish.

III.3. Chruščëv's Era – A Paradox

The political situation had overcome the *impasse*; the fight for succession was concluded: Nikita Sergeevič Chruščëv had finally and definitely emerged from the mass of Stalin's heirs. A new era was starting.

This has been generally known as an era of major international appeasement — as a result of the theories of peaceful competition, the space race and, primarily, perhaps, the acquired conscience of the atomic power.

On the national plan, appeasement corresponded to a possibly exaggerated optimism, as a result of reconstruction, power and success. This also corresponded to increased democracy; the more necessarily so, because of the results of the XX (1956) and XXII (1961) Congresses of the Soviet Communist Party, based on the condemnation of Stalinism, and the rejection of its methods.

It could be expected, therefore, that the new liberal wave would produce its effects in the cultural field, too, and gradually suppress political interferences, and secure guaranties for the free development of discussion. As a result, Lysenko's monopoly — already seriously challenged and shaken by the “Botaničeskij Žurnal” — would have certainly collapsed.

Quite to the contrary, and strangely enough, Lysenko was once again given definite political support. The Editorial Staff of the “Botaničeskij Žurnal” was removed and replaced with a new one, following Lysenko's line. This has been interpreted in terms of personal relationships and friendship between Lysenko and Chruščëv. As a matter of fact, although tempered by the past shock and the new situation, Lysenko could hold most of his privileges.

This was the conclusion of the second round of the genetic controversy — a paradox of a cultural policy, for so many aspects contradictory and disconcerting.

III.4. The Management Era

III.4. I. THE RESTORATION

The apparently sudden, but carefully prepared, peaceful destitution of Chruščëv, in October, 1964, marked a rather sharp turn in Soviet policy. A long period of exaggerated and, sometimes, completely unjustified optimism, dilettantism, contradiction, grotesque gestures and bourgeois tendencies — were to be replaced by austerity, strictly scientific management, and deeper political circumspection.

It was recognized that the past optimism was rather out of place, the Nation's economic situation being far from satisfactory. Agriculture, in particular, was

lagging more than ever, having undergone actual disasters, due to a whole series of failures. In his report to the December 9th, 1964 Session of the Supreme Soviet, the new Premier stated: "In the past years, a number of irresponsible recommendations and instructions have been given, concerning problems of agrotechnique, the structure of sowing areas, cattle breeding, as well as many other problems of agriculture." (Kosigin, 1964).

This sharp criticism of Chruščëv's agricultural policy necessarily entailed a condemnation of the continued trust and support given to Lysenko¹, notwithstanding the evident and repeated failures of his Agrobiology. On the other hand, scientific aspects were also examined, and it was agreed that: "Not all useful advances resulting from scientific research are conveniently applied in our plans..." (Kosigin, 1964).

Chruščëv's destitution and the new political trends marked an immediate rescue of classic geneticists. Rather than a third round of the controversy, this was actually the preparation of Lysenko's destitution, already decided by the political power, and to become effective a few months later.

In fact, already on November 22nd, "Pravda" — the official organ of the Party — published an article, in which it could be read: "It is no secret that the delay in the branch of genetics, in our country, is largely connected to the negative influence of Stalin's personality cult, to arbitrary acts and to the bureaucratization of Science." (Beljaev, 1964).

Two days later, on November 24th, one of the most important journals of general culture, the "Literaturnaja Gazeta", published the transactions of a Round Table on the Problems of Biology, in which eminent scientists had met to discuss about the problems of genetics, and the best way to regain all the time lost, as a result of Lysenko's faults; trying to find out the right and the wrong, apparently free to express their opinions, finally re-discovering the very spirit of the scientific method. The conclusions were: "It is, now, necessary to reject dogmatism and to have free scientific discussions. ... The press has to cooperate to these discussions, without complaints, attacks, injuries. ... It is necessary to definitely establish what was right or wrong, and the faults made in all branches: in the scientific theory, as well as in the practice; in agriculture, as well as in agrochemistry and theoretic biology." (Gavrilov, 1964).

The importance of the above events, and their impact on the whole cultural life of the Nation, need hardly be stressed.

On February 4th, 1965, "Pravda" published a long article by the President of the USSR Academy of Sciences. This was a responsible and careful analysis of the past events in biology, as well as of the problems related to its future development.

"A great rôle, in the development of biology, has been played by the position of monopoly of a group of students, lead by academician T. D. Lysenko, who rejected a series of important trends of biological sciences, and imposed their own viewpoints, frequently contrasting with the actual level of science and with experimental facts...

¹ Cf. Joravsky, 1965 (*art. cit.* p. 410).

In order to impose the wrong viewpoints, administrative methods were used. Many scientists were hindered from working in their field, limitations of study were made in the scientific Institutes, and important scientific acquirements were excluded from school and high school programs. The ensuing situation remarkably delayed the obtainment and utilization of highly productive forms of hybrid mais, the utilization of polyploids and of other new resources of the work of selection. The denial of the acquirements of genetics played also a rôle in the development of medicine. Nevertheless, I think that... we must not reject in block all he (*Lysenko*) has done. In particular, according to eminent scientists, his theory of the 'stage' development does have scientific importance. ... Academician Lysenko's position of absolute monopoly must, however, not be prolonged. ... If we re-establish a normal scientific atmosphere in biology... there will hardly be a possibility for the unjust situation we have witnessed in the past, to repeat itself." (Keldyš, 1965).

A few days later, on February 11th, 1965, the following Tass announcement appeared on "Pravda": "The session of the Lenin Soviet Academy of Agricultural Sciences, devoted to organizational problems, has been opened yesterday in Moscow. Academician P.P. Lobanov has been appointed President of the Academy, and Academician L. I. Sinjagin Vice-President". No mention was made of T. D. Lysenko: his long period of monopoly was officially concluded.

III.4.2. THE PRESENT SITUATION

With the month of July, 1965, the new Journal "Genetika" started being published by the Soviet Academy of Sciences (Izd. Nauka). Number 1 opened with a full-page picture of Gregor Mendel, followed by an Editorial, entitled "Genetics in the Service of the People", and by the reproduction of two articles by late Prof. Vavilov. "Genetika" is edited by P. M. Žukovskij, S. I. Alihanjan, D. K. Beljaev, and the Editorial Board is composed of the following members: B. L. Astaurov, N. P. Dubinin, M. I. Hadžinov, M. E. Lobašev, P. P. Luk'janenko, V. S. Pustovojt, I. A. Rapoport, Y. N. Stoletov, N. V. Tsitsin, V. D. Tumakov, N. V. Turbin. Most of these scientists were also included in the Soviet delegation of 85 members, headed by Prof. Dubinin, which, in August, 1965, was sent to Czechoslovakia, to take part to the celebration of the centenary of Mendel's discoveries.

Published as a monthly, the new Journal contains an average of 180 pages of text per number. It reflects the results of all the main works in the field of Genetics, obtained in the various laboratories of the whole country. Articles of foreign scientists are sometimes also published. The papers, published in Russian and followed by English summaries, are mainly devoted to problems of Mutation, Hybridization and Selection in Plant Genetics, but other topics of general, or particular interest are also frequently dealt with. A review of genetic literature is also included: a number of foreign genetic journals are indexed, and a subject list of both Soviet and foreign publications is indicated, subdivided according to the

various branches of Genetics. Human Genetics is included. Cytology is specifically dealt with by the new periodical "Citologija". And another new Journal of Cytology and Genetics is announced for 1967: "Citologija i Genetika".

Genetic articles are, however, not confined to "Genetika". "Trudy Instituta Genetiki" — a periodical bulletin of the Genetic Institute, formerly following Lysenko's line — has recently turned to neo-Mendelian genetics, officially announcing a new policy (Cf. n. 32, 1965).

A great many periodicals, both scientific and nonscientific, appear to regularly include research reports, articles, reviews, announcements on the various topics of Genetics. Human and Medical Genetics are mainly dealt with in the Bulletin of the Academy of Medical Sciences. A large number of textbooks and monographs are published by "Nauka".

Mendel's name is generally honoured: his papers have been translated and largely commented upon (Gajsinovič, 1965); the importance of his work is largely stressed. The same applies to the great Soviet geneticists, such as Vavilov, but also to Mičurin and Timirjazev. Lysenko is rarely mentioned, but the "period of dogmatism" is frequently referred to.

Genetics is now supported by a central organisation, mainly consisting of: (i) *The Institute of General Genetics of the USSR Academy of Sciences*; (ii) *The Scientific Council for Problems of Genetics and Selection of the USSR Academy of Sciences*; (iii) *The Academy of Medical Sciences*, with its various Institutes, and a relatively large number of University Departments of genetics and allied sciences¹.

Genetic research is however being carried out in all kinds of medico-scientific Institutes, agrobiological centers and stations; papers on genetic subjects also happen to come from nonscientific institutions. This may be explained by referring to the past dispersion and disguise of geneticists, as well as to the ever growing interest in Genetics as a whole, possibly as a result of its outstanding development in other countries, as a reaction to past events, and for its now representing a sort of herald of the new times.

¹ An account of the present status of genetic research in the USSR may be found in Swaminathan, 1966 (*art. cit. p. 410*).

PART IV

GENERAL DISCUSSION AND CONCLUSION

We have thus seen how, finally delivered of its grievous hypothec, Soviet genetics has rapidly come of age. An overwhelming mass of work — accomplished by a very large number of biologists, differing with respect to age, background, kind and place of work, but all equally enthusiastic — appears to guarantee a rapid re-gaining of the time lost, and a subsequent, outstanding development.

“Today, the situation in Research Institutes is similar to the one existing in the early thirties and, as far as I can see, to that of the Scientific Center at Novosibirsk, with its whirl of ideas. The only difference is that the state of alarm, then dominating at Novosibirsk, has now disappeared.” (Šarov, 1965).

The only trouble is that this feeling be not completely justified by the actual circumstances. Although a progressive liberalization is being noticed in Soviet cultural life, the institutional control exerted by the Party in every field, might again turn too heavy for Science to stand it.

Actually, the load of the Party's hypothec is still witnessed by many indicative statements, which may be found, here and there, in most recent writings and discussions, notwithstanding the denouncement of the past methods of control.

With reference to the presence of injurious terms in a scientific article, a corresponding member of the USSR Academy of Sciences has said: “It is my opinion that such methods be sharply contrasting with our Party's program, according to which only free and constructive discussions may guarantee a normal development of Science.” (Kedrov, 1965). The feeling is, however, that such a basic scientific principle should never be put into discussion, and should not be held valid only because, or when, this be the Party's program.

Studitskij (1965) appears to be highly reasonable and right, when inviting his colleagues to forget personal injuries and the wrongs suffered. His statement that the tasks of Soviet scientists be *mainly* those established by the Party appears, however, to be formally unacceptable.

The Party's traditional myths: Darwin, Marx, Lenin — and the universal range and impact of their work — are as valid as ever.

According to Nejfach (1965) “Modern scientific genetics is based on Darwin's theory”.

According to Paramonov (1965) “The most serious result” of the past events “is a weakening of Marxist-Leninist positions in the field of biology”.

With reference to a possible development of the theory of the inheritance of modifications, Studitskij (1965) inquires: “Why shouldn't we admit the possibility of extending our knowledge of this theory, which has been, by and large, developed by Engels and accepted by Darwin?”.

Lenin's analysis of the philosophical problems related to natural sciences is also largely referred to.

The importance of Soviet contributions keeps being stressed and often exaggerated. Michurinism has been practically overcome, but keeps being referred to as true science: "The time has come to rigorously and definitely establish the object of a really Michurinian Science..." (Kedrov, 1965).

The principles of Marxism-Leninism and the wishes of the Party are generally referred to in every publication. The impression is that this should serve as a guarantee for freely expressing one's own ideas.

In conclusion, the Party's leadership in Science, as in anything else, has to be, at least formally, accepted. Referring to a struggle between materialism and idealism in natural sciences, a Chinese Michurinist emphatically stated: "To deny this, is to reject the leadership of the Party in science." (Kiang Yu-nung, 1958).

Soviet scientists have now the occasion to demonstrate that "Science comes first", also by means of a plain evaluation of Lysenko's work, notwithstanding his political destitution. For it should be stressed that rejecting, or ignoring the bulk of Michurinism and of Lysenko's work, could prove just as wrong as Lysenko's reject of Classic Genetics.

Ideological and political support, fanatic enthusiasm and lack of criticism have probably damaged Michurinism more than anything else. Perhaps, a normal scientific atmosphere could have promoted a better development and understanding of some of its aspects and work. This should be realized when striking the balance of past events.

PART V

V.1. Summary

Genetics in the Soviet Union has undergone a profound and long crisis, involving the realm of Biological Sciences and Science and Culture as a whole.

This was not merely due to the emergence of neo-Lamarckian Michurinism, claiming the inheritance of acquired characters to be possible and necessary, and the genotype to be plastic and shakable, especially under particular environmental and physiological conditions: this could have been the object of scientific discussions, probably of a controversy, too, just as one century ago, but would have hardly involved matters of principle and of method in Scientific Research, nor would the controversy have degenerated, absurdly giving rise to a "Western" and a "Soviet Science".

Two closely connected factors, equally important and equally witnessing a reject of the principles underlying the scientific method, may be considered as the actual source of this partition of Science, namely:

i) The assumption of a primacy of Ideology, thus making Science be submitted to it, and scientific theories be held right or wrong, according to their fitting or not ideological ones;

ii) Violent political pressures and administrative coercion on scientific thought, and on scientists themselves.

Along with such matters of principle, matters of method in research planning and the formulation of results made it impossible to reach a plain evaluation of Lysenko's theories and results.

Now that a normal atmosphere appears to have been re-established for the development of genetic research in the Soviet Union, rejecting, or ignoring the whole of Lysenko's work, could prove just as wrong as Lysenko's reject of Classic Genetics.

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Notes

The quotations reported have been all put into English by the Author, on the basis of the texts available — possibly, the original ones, but, sometimes, translations themselves.

Russian names have been generally transcribed according to the following method worked out by an International Convention of specialists, and now generally known and adopted by Slavists as the “Scientific Transcription” (cf. Table). Already transcribed, well known names have not undergone new transcription.

Table
Scientific Transcription of the Cyrillic Alphabet

Letter	Transcription	Letter	Transcription
А	a	Р	r
Б	b	С	s
В	v	Т	t
Г	g	У	u
Д	d	Ф	f
Е	e	Х	h (ch)
Ё	ë	Ц	c (ts)
Ж	ž	Ч	č
З	z	Ш	š
И	i	Щ	šč
Й	j	Ъ	'
К	k	Ы	y
Л	l	Ь	'
М	m	Э	ê
Н	n	Ю	ju
О	o	Я	ja
П	p		

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RIASSUNTO

La Genetica nell'Unione Sovietica ha attraversato una lunga e profonda crisi, che ha interessato l'intero settore della Biologia, ripercuotendosi su tutto il mondo della Scienza e della Cultura.

La causa di ciò non fu il semplice emergere di un Miciurinismo neo-lamarckiano, secondo il quale l'eredità dei caratteri acquisiti sarebbe possibile e necessaria, ed il genotipo sarebbe plastico e suscettibile di « scuotimento », specialmente in particolari condizioni ambientali e fisiologiche dell'organismo. Ciò avrebbe certamente dato luogo a discussioni scientifiche, probabilmente anche ad una polemica simile a quella del secolo scorso, ma difficilmente avrebbe comportato questioni di principio e di metodo, né la polemica avrebbe degenerato, fino a dar luogo, assurdamente, a due « Scienze » diverse: una « Occidentale » ed una « Sovietica ».

All'origine di tale frattura della Scienza, possono essere riconosciuti due fattori, strettamente connessi, ugualmente importanti ed indici di un rifiuto dei principi fondamentali del metodo scientifico:

1. L'assunto di un primato ideologico, che ha fatto sì che la Scienza fosse soggetta all'Ideologia, e che le teorie scientifiche venissero considerate giuste o errate, secondo che concordassero, o meno, con quelle ideologiche.

2. Le violente pressioni politiche e la coercizione amministrativa esercitate sul pensiero scientifico e sugli stessi ricercatori.

Oltre a tali questioni di principio, questioni di metodo nella strutturazione dei lavori e nella formulazione dei risultati hanno reso impossibile una serena valutazione delle teorie e dei risultati ottenuti da Lysenko e dalla sua Scuola.

Ora che una normale atmosfera sembra esser stata ristabilita per lo sviluppo degli studi di Genetica nell'Unione Sovietica, voler respingere, o ignorare, il lavoro di Lysenko nel suo insieme, potrebbe risultare altrettanto sbagliato del rifiuto di Lysenko nei riguardi della Genetica Classica.

RÉSUMÉ

La Génétique dans l'Union Soviétique a traversé une crise longue et profonde, qui a intéressé tout le secteur de la Biologie, ainsi que la Science et la Culture dans leur ensemble.

Ceci ne fut pas produit simplement par le développement de ce Mitchourinisme néo-lamarckien, d'après lequel l'hérédité des caractères acquis serait possible et nécessaire, et le génotype serait plastique et susceptible d'être « secoué », surtout dans de particulières conditions physiologiques et du milieu de l'organisme. Cette théorie aurait sans doute donné lieu à bien des discussions scientifiques, probablement aussi à une polémique du genre de celle du siècle passé, mais aurait difficilement entraîné des questions de principe et de méthode; ni la polémique aurait-elle dégénéré, jusqu'à produire l'absurdité d'une fracture de la Science entre « Occidentale » et « Soviétique ».

A l'origine de cette fracture l'on peut reconnaître deux facteurs strictement conjoints, également importants et indices d'un rejet des principes fondamentaux de la méthode scientifique:

1. L'affirmation d'une primauté idéologique, qui fit que la Science fût soumise à l'Idéologie et que les théories scientifiques fussent considérées justes ou fausses d'après leur accord ou désaccord avec les théories idéologiques.

2. Les violentes pressions politiques et la coercition administrative exercées sur la pensée scientifique et les chercheurs eux-mêmes.

A part ces questions de principe, des questions de méthode dans la structuration des travaux et la formulation des résultats n'ont pas permis une évaluation réellement objective des théories et résultats de Lysenko et son Ecole.

A présent, une atmosphère normale paraît avoir été ré-établie pour le développement des études de Génétique dans l'Union Soviétique; toutefois, rejeter, ou ignorer le travail de Lysenko dans son ensemble pourrait résulter aussi faux que le rejet de la Génétique Classique de la part de Lysenko même.

ZUSAMMENFASSUNG

Die Genetik hat in der Sowjetunion eine lange und einschneidende Krisis durchgemacht, welche den gesamten Sektor der Biologie betraf und sich auf die ganze wissenschaftliche und Kulturwelt auswirkte.

Der Grund dafür war nicht allein die Tatsache, dass ein neu nach Lamarck ausgerichteter Mitschurinismus aufgetaucht war, demgemäss die Vererbung der erworbenen Eigenschaften möglich und sogar notwendig, der Genotyp des weiteren, besonders unter bestimmten physiologischen bzw. Umwelts-Umständen des Organismus, plastisch und « Erschütterungen » ausgesetzt wäre. Dadurch wären gewiss wissenschaftliche Diskussionen, möglicherweise auch eine Polemik wie diejenige des vorigen Jahrhunderts ausgelöst worden, doch schwerlich hätten sich daraus Probleme über Prinzipien und Methoden ergeben, und die Polemik wäre auch nicht so weit ausgeartet, dass es zu dem « absurdum » von zwei verschiedenen « Wissenschaften », d.h. einer « Westlichen » und einer « Sowjetischen », gekommen wäre.

Diese Fraktur in der Wissenschaft lässt sich auf zwei eng miteinander verbundene, gleich wesentliche Faktoren zurückführen, die zugleich auch Anzeichen für die Ablehnung der Grundprinzipien der wissenschaftlichen Methode sind:

1. Die Annahme eines Primats der Ideologie, wodurch die Wissenschaft dieser untergeordnet und die wissenschaftlichen Theorien je nach dem, ob sie mit den ideologischen übereinstimmen oder nicht, als richtig oder falsch betrachtet wurden.

2. Der starke politische Druck und der verwaltungsbedingte Zwang, der im wissenschaftlichen Denken und auf die Forscher selbst ausgeübt wurde.

Ausser diesen Faktoren machten auch Unstimmigkeiten über die bei Strukturierung der Arbeiten und bei Formulierung der Ergebnisse anzuwendenden Methoden eine strenge Bewertung der von Lysenko und seiner Schule aufgestellten Theorien und erlangten Resultate unmöglich.

Wen man nun, da scheinbar wieder eine normale Atmosphäre für die Entwicklung der genetischen Forschung in der Sowjetunion hergestellt ist, die Arbeit Lysenkos insgesamt ablehnen oder übersehen wollte, so wäre dies genau so falsch wie die Ablehnung Lysenkos gegenüber der klassischen Genetik.