with our agriculture. And in those years, each problem was like a battle front. It was a battle for bread, for the food of millions, for the life of our country.

And the soldier on these fronts, Lysenko, went where the country most loudly called him. He developed his theory further and pondered over agronomic methods and harrows. He was both a researcher and an agronomist, a field engineer; but that field stretched over millions of hectares, and so he acted as a superagronomist, or, as I would like to say—the People's Agronomist of our country.

THE HISTORY OF THE DANDELION

One day, while working on the introduction to his book, *The Theoretical Principles of Vernalization*, Lysenko summed up what had been achieved. He enumerated the major items—what we have related in these pages and what we have not managed to relate: acceleration of the field life of cereals, vernalization and summer planting of potatoes, the saving of winter crops in the winter, the deliberate selection of parent couples in crossing, a variety created in two and a half years, and "an entirely new method of seed growing. . . ." This last short phrase, in its turn, was of rich and complex content: it contained Lysenko's fundamentally important thesis that the best seeds are obtained from plots with the highest yield; and it also contained the idea that he strongly insisted on, namely, that preserving the purity of a variety does not mean preserving only its "shirt," the rough collection of its outward characters, but preserving its entire *living* substance. It also included the rejuvenation of varieties by intravarietal crossing and new, quick methods of multiplying the first handful of precious seeds—in short, that which, serving as the basis of seed-growing work since the latter half

of the thirties, had indeed created "an entirely new method of seed growing."

Lysenko mentioned many other things. And he wrote that all of them were but branches growing on one stem, all were "offshoots" of the theory of phasic development.

As we know, this theory is of profound general biological significance. The knowledge of the important law of development of living beings with which it has armed science has opened for man a new field of creative work, a new field for the alteration of nature. These new potentialities ought to be described with striking words: evolution taken into human hands.

Therefore, another "offshoot" of the theory of phasic development could have been expected, this time dealing directly with the foundation of foundations of biology, with the very essence of the theory of evolution.

Darwin was alive when science in our country was already competing for first place as regards scope and depth of research in the sphere of Darwinism. A whole galaxy of splendid scientists soon raised the theory of evolution in Russian science to an immense height. K. A. Timiryazev, the brothers Kovalevsky, I. I. Mechnikov, A. N. Severtsov, M. A. Menzbir—and a host of others.

What they did was of fundamental importance for science. Their work infinitely enriched the theory of evolution itself as well as our knowledge of how the evolution of life proceeded on Earth, of how each individual organism develops, and how this individual development refracts, reflects, the long history of incalculable generations behind this tiny germ.

Actually, it was Russian scientists who introduced the evolutionary principle into all branches of the science of life.

And Soviet science—the heir to the best traditions of Russian science—wrote a most important new chapter of

the world "biography" of Darwinism. Research, the deepening of the great theory of the development of living nature, has advanced with giant strides in our country.

It was in Soviet times that the late Academician Severtsov published his major, classical works.

In Soviet Land, Darwinism found a second motherland. Here it rose to a new stage and acquired unprecedented qualities. It became creative Darwinism.

Michurin science has become a fundamentally new stage in the entire development of Darwinism.

So what is there surprising in the fact that Academician T. D. Lysenko, the foremost representative of Soviet creative Darwinism, came out with his ideas about the very essence of the theory of evolution?

The ideas that Lysenko expounded on November 5, 1945, in his lecture at the improvement courses for state plant-breeding station workers, that he expounded later in his articles in *Sotsialisticheskoye Zemledelye*, and in a number of other articles and books, must, undoubtedly, have arisen in his mind much earlier. Already in 1943, the cluster sowing of kok-saghyz that he had recommended, and which he regarded as being inseverably connected with his new conception of the very ABC of Darwinism, was being widely practised; and earlier still, in 1940, his lecture on "Engels and Certain Problems of Darwinism" that he delivered at the Academy of Sciences gave all grounds for anticipating his subsequent ruthless criticism of "intraspecific competition."

Yes, the controversy raged around the question of intraspecific competition, of the mutual struggle between individuals in the same species, which authors of textbooks on Darwinism were inclined to proclaim as one of the three pillars that supported the theoretical edifice erected by the "hermit of Down."

Lysenko was simply of the opinion that there was no such thing as intraspecific competition.

A dandelion

But when we were at school, did we not, together with theorems in Euclid, study calculations which showed that one pair of elephants could fill the world with elephants in the course of seven hundred and something years, and that one dandelion plant could fill the world with dandelions in less than ten years, if all the young elephants survived and all the winged dandelion seeds sprouted? There appeared to be nothing to argue about. "Struggle for existence," was the conclusion drawn in the textbooks. Only a tiny fraction of the newborn creatures survive. The rest are destroyed in the ruthless battle of life. And the textbooks capped this with the observation: "This battle is exceptionally fierce, of course, among the individuals of the same species, for they all demand the same thing from external environment. Hence, they, first of all, come into conflict with each other."

Lysenko was perfectly well aware that in the opinion of "many (if not all) Darwinists," these arguments led with inexorable logic to intraspecific competition. Recognition of this competition was even "taken out of the brackets," as it were, assigned to the category of copybook truisms not worth rehashing. Their comforting presence behind the scenes was taken for granted as an additional guarantee of the stability of the edifice that is being erected, in the same way

as an architect takes it for granted that the earth is solid, and a mathematician, that an axiom is correct.

Is not propagation in geometrical progression a fact? And, consequently, the necessity of weeding out, of selecting, among all these hordes that are striving to fill the earth? And consequently, competition within these hordes?

But in this seemingly stout chain of "consequentlies," Lysenko found the weak link.

Geometrical progression—consequently, competition within the "hordes".... Nonsense! In seven hundred years the elephants would be pressing closely side to side from the Tropics to the Hyperboreas; but meanwhile, hunters are finding it more and more difficult to find elephants even on the shores of Lake Chad.

The tacit assumption of overpopulation, of congestion (which they did not always take the trouble to find and point to in nature, but in the most cases accepted on faith, on the basis of mathematical calculations)—was not this the first weak link in the "chain"?

Lysenko enquired ironically: So, actually, the poor rabbits suffer more from each other than they do from wolves and foxes?

And how, he enquired further, does this intraspecific struggle harmonize with the theory of natural selection, with Darwin's theory itself? Does not natural selection result in the species acquiring and accumulating useful characters? In what way is the direct or indirect mutual extermination of the individuals useful for the species? Perhaps suicide is the best method of sustaining life and health?

In opposition to the arguments and observation of those who recognize the existence of an intraspecific struggle, Lysenko adduced his own arguments and facts; and they were extremely characteristic. Knowing Lysenko, one could have

foreseen what they would be. They were the arguments of agrobiology, and the facts were taken from the practice of the agriculturist.

It is interesting to recall that Darwin established his theory by contrasting the armchair speculations of those who argued about the "invariability of forms" to the results of the work of men who were actually altering the living world. Today, Lysenko, in controversy with Darwin on a certain question, also bases himself on the needs, the experience of the men who cultivate the fields, and on the vast experience gained in socialist fields at that!

What is a crop, what is a good crop? After all, it is the achievement of living harmony in the fields within the particular variety of plant that is being cultivated and its harmony with the other varieties, its field neighbours, with its predecessors, and with the plants that will be planted after it. The science of crop raising is precisely the science of this living harmony.

"One can believe," says Lysenko, "that weeds, which are varieties other than wheat, for example, hinder the latter, suffocate it. But nobody will believe that sparsely-sown, and therefore weed-mixed, wheat is better off in the field than densely-sown pure wheat. . . ."

Darwin warned that "it must never be forgotten that all living organic beings strive to propagate in geometrical progression."

And yet, real, practical agriculture often has to grapple with the problem of obtaining a crop of seeds that will at least suffice for sowing. Lysenko mentions alfalfa and clover. Sometimes the land on which these have been grown has to be planted with other crops because the amount of seed collected from alfalfa and clover crops is not even equal to the amount originally sown.

Why is this? Where is geometrical progression?

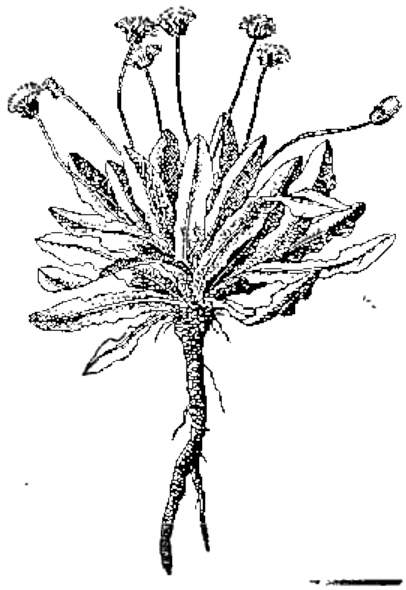
Alfalfa seeds are not aviators capable of riding the wind, and not cunning enough to take a ride in the wool or stomachs of animals, as the seeds of so many other plants are. No, they simply and modestly fall to the ground. But they fall on a thick, smooth, dark-green, sweet-smelling carpet; they do not reach the soil and cannot sprout. They are useless. Hence, as a result of many thousands of years of natural selection, the species alfalfa acquired the ability to adapt itself to the conditions of its environment. When thickly sown, it hardly ever sets seeds; every plant, in the following year, simply throws out new shoots from the roots.

But, Lysenko points out, if alfalfa, planted in the field, is thinned out, leaving small clumps, or "bouquets," each "bouquet" will set seeds.

Why do seed growers exert such effort and care forthwith to eliminate admixtures of low-yield varieties from purebred varieties of seeds? One would think there was nothing to worry about—after one or two generations the higher-yield variety, that is, the hardier one in the "struggle" between varieties, would completely oust the feeble one that had entered the fight in microscopic proportions. Isn't that so? But it is not so. The feeble admixture will multiply, grow, and eventually overpower the strong one. Every experienced seed grower knows that this is true. But why is it so?

If it were alone, the "feeble" variety would be unable to withstand the attacks of pests and disease; it would be unable to combat the weeds. But here it is completely surrounded by its strong "comrades" of the plant species, and the "admixture" begins unhindered to propagate under reliable protection. Lysenko quotes the example of the wheat, Odessa 13, which is not affected by the Hessian fly, and Lutescens 062,

which is; in this respect the Lutescens, which, in general, is an excellent variety, is weak. Now let us imagine that some admixture of Lutescens had got into a field planted with Odessa. There will be scarcely any Hessian flies in this "inhospitable" field, and the chances of survival for each Lutescens plant will be much greater than in its own field.



Kok-saghyz

Lysenko took his stand on the experience of seed growers, of the kolkhoz fields, of the work of millions of human hands and, with his characteristic ardour, he fiercely attacked those who challenged his claims on alleged "academic" grounds that were inimical to the interests of the people.

But what about the dandelion, that classical example of propagation in geometric progression? Very well, let us take the dandelion, but a variety that is very useful to man—kok-saghyz.

As long as kok-saghyz was sown in lines, so that the growing plants should not crowd each other, it grew badly, barely sprouted, and only a few, fluffy seeds appeared on each plant. The amount of seed collected was scarcely equal to the amount planted.

In 1943, Lysenko proposed a radical change in the method of cultivating kok-saghyz. It must be sown in clusters, he said, 100 to 200 seeds in each cluster (even 200 to 300 if the supply is plentiful).

Two hundred seeds to the cluster—what congestion there must be there! But this did not daunt Lysenko. He argued as follows.

Kok-saghyz is an inhabitant of the thicket, it is a "cellar dweller." To plant it alone in the sun and wind, carefully to smooth its leaves and walk on tiptoe around it to break up the soil and not allow even a blade of grass to remain near it, would be a disservice to it.

When planted in clusters, however, a bunch of buds will spring up, a cap of kok-saghyz leaves clinging closely to each other, rather long, and smoother-edged than our ordinary dandelion. The small thicket will rise out of the cluster, and its mortal enemy, the weeds, will be unable to get at it. The soil underneath is more moist, and the dew remains in its depths until midday—it has its own microclimate. . . .

The cluster sowing of kok-saghyz has been practised for a number of years already, and Lysenko considers that he has a right to draw the conclusion: "in this case, the question of intraspecific competition does not exist for agricultural practice."

The cluster-sowing method rapidly spread throughout the country and, as the textbooks on plant breeding say, has become the chief method of growing kok-saghyz.

The cluster-sowing method has resulted in an increase in yield (taking the returns of the plantations on which this method is employed on a large scale) not of "so much per cent," but of several hundred per cent.

Formerly, the average yield of kok-saghyz root (for the sake of the milky sap of which this plant is cultivated) did

not exceed 4-5 centners per hectare. Before the war, the kolkhozniks in the Sumy Region harvested an average of 13.9 centners per hectare, and in one district in the Kiev Region 16.5 centners. This was regarded as a record, and bigger yields were obtained only in very small plots.

But today, in the postwar period, the kolkhozes that have adopted the cluster-sowing method are harvesting 20 and 30 centners of roots per hectare. Crops of 40-50 centners per hectare are not rare, and scores of kolkhozes have achieved the record of 100 centners and over.

That is how the turning point in the history of the dandelion was reached.

We have no plantations of the notorious hevea in our country, but we can already say that the time is coming when the "natural rubber problem" will no longer confront us. Our own plantations of the humble dandelion will provide us with all the rubber we need. And rubber of excellent quality, second to none in the world.

Rubber growers have worked out a harmonious combination of measures for the cultivation of kok-saghyz. The tending of the plants begins even before they are born—with the preparation of the soil on which they are to grow; and this preparation is conducted with exceptional attention and care. Deep ploughing: where the stratum of ploughing soil is thin, it is gradually thickened. The soil must be rich in food for the roots, and so plenty of manure, or peat, is "ploughed in."

Most often the seeds are planted in the spring, but autumn planting is not rare. When the planting is done in the spring, it is first of all necessary to waken the seeds; for, as is the case with the majority of wild plants, they have long been immersed in deep slumber; only in a hot summer would they sprout well of their own accord. The seeds are therefore