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STEEL "MOUSE" AND AUTOMATONS

-USSR-

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FOREWORD

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[Following is the translation of an article by N. Il'inskaya in Ekonomicheskaya Gazeta (Economics Gazette), No 156 (828), Moscow, December 1960, page 4.]

Cybernetic toys ... At first glance it seems absurd that scientists occupy themselves with such toys in all seriousness. In many scientific-research laboratories one may find electronic "mice" and "turtles", robots of steel learning to speak and even to read, and even a "chess player" capable of winning a game, or of manifesting protests if his opponent violates the rules of the game.

These seemingly useless, unique bric-a-brac pieces do not exist for the amusement of children, but do serve science. They are the prototypes of mechanisms which simplify and make easier the mental work of men.

Visualize for yourself a square box divided by a large number of partitions. A toy cybernetic "mouse" is placed into one of the compartments, while an iron piece of "bacon" is placed in another compartment, most distant from that containing the "mouse." The latter, as if perceiving the smell of food, begins to grope its way through the labyrinth, and gradually, rejecting wrong courses of progress, comes to find the "bacon." When the process is repeated, the "mouse" proceeds with confidence on the shortest course to the "bacon."

And now recall how much unproductive labor and time is often wasted in search for necessary data ... Soon electronic machines will occupy themselves with such tasks. They will be able to hold within their memory a huge amount of factual data, presenting upon request everything known on a given topic or subject. This will be a unique "electronic encyclopedia." It will differ from ordinary encyclopedias in that the reserve of information stored in it will be constantly replenished and renewed.

What then is the difference between a simple toy and a complex automaton? The fact is that the "mouse" is a self-tuning [self-programming?] electronic machine capable of remembering accumulated results of experience and of finding the best solutions with regard to arising conditions of a situation.

It is easy to imagine how an "electronic encyclopedia," such as mentioned above, will work. In such a machine the "bacon" will be

the section-cells holding information pertaining to certain fields of science, technology and art. The large sections will be subdivided into smaller, and those in turn, into ever smaller sections, thus forming a sort of labyrinth, as it were. Receiving a request, the automaton, just like the "mouse," will investigate all the section-cells of its memory until it finds the "bacon," i.e., the requested section, and then it will issue the needed information.

The "mouse in the labyrinth" may be regarded also as a prototype of an automatic telephone station of a new type. The existing automatic telephone stations (ATS) have one great shortcoming. They are incapable of receiving signals other than those of revolving disks, and are noted for slowness of functional action.

The new ATS will be able to remember with whom a subscriber to the service talks on the phone most often. This will lead to the formation of durable linking chains facilitating the shortest path of connection.

And isn't it possible to utilize the schemes of cybernetic +---s for the creation of automatic regulators of production, which would take into account the flow and course of processes, would adapt themselves to changes in the quality of raw materials, and would react to the wear and tear of instruments.

Yes, that is possible. And already we can mention as an example one of the shops of the Voronezh Synthetic Rubber Plant, where the employment of a self-learning machine is being projected. At first the machine will merely observe and memorize the activities of experienced workers, but when the best work program will have formulated itself in the machine it will be entrusted with the conduct of the manufacturing process.

By means of the automatic search the machine will be able constantly to make precise the most profitable work program. An ever more perfect program, and ever more perfect and expedient method of management will accumulate in its memory. It will acquire, if one may say so, the creative abilities of directing production.

This is how many unique schemes have been already formed on the basis of the cybernetic "mouse."

And what about the "turtle?" To what sort of ideas did it lead the scientists? Here we have to tear ourselves away from our planet and, overcoming the force of terrestrial gravity, descend one of the nearest planets together with the first cosmonaut. It will be a self-propelling instrument. It will study the surface of the planet, the composition of its atmosphere, and other factors. The tireless explorer will not be hampered by any obstacles, which he will skillfully overcome as if guided by the senses of vision, smell and hearing.

Connecting threads from that complex automaton lead to the toy turtle which amusingly crawls about the floor in search of light.

The comparison of the principles of control in living organisms with the principles of control in machines has turned out to be a fruit-

ful one. The scientists have even learned to train their metallic creations. In one scientific-research laboratory we were shown an interesting experiment with a cybernetic "dog."

A metallic model of food was brought to the "dog" while an electric bulb was lit at the same time. A symbolic secretion of "saliva" commenced in the "dog." After numerous repetitions of the experiment, only the bulb was lit, but the food was not brought near. The model of the dog nevertheless secreted "saliva," just as did its live prototype in the well-known experiment of Academician Pavlov. The model had developed a conditioned reflex.

The possibility of creating -- on the basis of cybernetics -- models which imitate biological processes, opens great opportunities for new research in the field of medicine.

Thus, a cybernetic toy ... Is it such a useless trifle, after all? ...

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