

own experience leads him to take a much higher saving as a possibility.

The last part of the lecture was given up to a description of the new position of the gas industry since the passing of the Gas Regulation Act of 1920, which instituted the charging for gas by the therm and removed many useless restrictions. The new Act, which was based upon recommendations by the Fuel Research Board, will, in effect, not only make it possible to obtain and distribute as gas a portion of the volatile matter of the coal, but also permit much more extensive gasification of the fixed carbon. This should open out quite a new field of efficiency and economy. The lecturer referred in particular to one modern development in the gas industry on these lines which has been investigated with considerable thoroughness during the last three years. The process of increasing the yield of gas by passing a current of steam through continuous vertical gas retorts while carbonisation is being effected was investigated by a joint committee of the Institution of Gas Engineers and the University of Leeds, and the results were presented to the Institution

of Gas Engineers at its annual meeting in 1920. These results, including chemical and thermal balances obtained with different quantities of steam, were obtained from one Scottish coal, but similar work extended to English coals and carried out later at the experimental station of the Fuel Research Board has added to our knowledge. "We can now say with confidence that there is not only a very substantial gain in therms in the form of gas, but also in the yields of tar and ammonia," when the steaming process is employed.

Sir George Beilby concluded his lecture by a brief summary and a reference to the present spirit of unrest, which complicates fuel and all other problems into which the human element enters:—

This spirit, as it is manifesting itself to-day, is fatal to the progress of reconstruction and development on any extensive scale, and we, whose chief interest in life lies in the control and use of the power and resources of Nature for the service of man, can only continue to do the work next our hand, while we cherish the hope that the better side of human nature, which we know is only temporarily overshadowed, will gradually reassert itself.

The "Proletarianisation of Science" in Russia.

By DR. BORIS SOKOLOFF (formerly Lecturer, Petrograd University).

"Science? What is science? It is only a tool in the hands of clever politicians."—From report of a public discussion on science held in the Petrograd Palace of Labour, September, 1920.

SCIENCE in Russia is now passing through difficult times. The experiments being carried out by the Bolsheviks in Russia are opposed to it—how could it be otherwise? Everything—art, education, poetry—have been "proletarianised"; why not science? During the whole of the year 1920 a campaign was being carried on against "bourgeois science." In the Press and at special meetings complaints were made of the reactionary tendencies of professors, of their strange indifference to politics, of the necessity of turning scientific men into advocates of the Soviet system. By the phrase the "proletarianisation of science" the Bolsheviks seem to understand a reorganisation of the methods of scientific investigation, the broadening of its basis, and its practical application. But the real idea at the back of their minds is to make science serve the ends of Bolshevism. This view was expressed as follows by Communist speakers at the Petrograd Students' Conference:—

Comrade Lounatcharsky is quite right in saying that science is now in the hands of mandarins of bourgeois origin. We must appropriate science; we must make it proletarian. In the place of professors and scientific men imbued with political indifference and *bourgeois* ideals we must put real proletarians, learned men who will be able to create a science which will be obedient to us.

Such is the theory. The "proletarianisation of science" in this sense is a matter of the independent reconstruction of scientific methods. But, in practice, the "proletarianisation of science" is quite a different thing.

Science is the crown of the human intellect; it is the sun which man has created from his own flesh and blood. It is necessary to realise that the work of a man of science is the property of humanity as a whole. Science inhabits the domain of the highest altruism. Scientific workers must be considered as the most valuable of men, the most productive element of society. The premature death of a man of science means a great loss to the country; this must be fully understood by the workers' Government.

Look at the death-roll of scientific men within the last few months, and you will see how great is the loss of scientific energy in our country. If this process of extinction of learned men continues at the same rate, Russia will be deprived of her brains. Free science is indifferent to politics. (Petrograd journal, *Science and its Workers*, No. 1: article on "What is Science?")

So writes Maxim Gorky, a supporter and faithful adherent of the Soviet Government. He writes, he tries to convince—whom? Not, of course, the Russian *intelligentsia*, who know the state of affairs better than Gorky himself. Gorky's appeal is evidently addressed to Bolsheviks, to the Soviet Government. However, they can neither understand nor appreciate the appeal. Being men of simplified views—doctrinaires and politicians—they cannot accept the fact that science must be independent of everybody and

everything. They think it quite right and advisable to make scientific men "obedient" executors of the commands of the Soviet Government.

During the last three years the "Palace of Science" registered the names of 420 Russian professors and scientific men who died from starvation. These are not occasional sad events; they constitute something regular, systematic. Letters which I have received from my friends and colleagues—Russian scholars—give a vivid picture of life under Bolshevism. For obvious reasons I cannot give the names of my correspondents.

"These two and a half years," writes Prof. X, "have been a continuous nightmare. The Bolsheviks declare us to be parasites and drones, and we have been deprived even of the scanty ration allowed to workmen and soldiers. Those of us—and not many were so lucky—who had any spare garments or possessions sold them in order to buy food. Those who had nothing sold their books, and that was the most terrible. . . ."

A professor of philosophy writes:—

It is easier for me than for others to understand Bolshevism. In it is something wild, something of the Russian recklessness. The experiments of the Bolsheviks remind me of the Eastern mountain tribes; in the life of such tribes blood-revenge is closely connected with primitive communism. I am rather interested in the Bolsheviks, impartially, as a philosopher should be. I do not mind the water freezing in my room, that instead of bread and meat I eat raw oats, or that one can write and create in Soviet Russia only during the summer months. But there is one thing which makes me despise the Soviet Government, and that is their endless lying.

"No, I and the Bolsheviks cannot understand each other," writes the Moscow Prof. W. "I, an old man, who can scarcely walk, whose feet, on account of the cold winter, are sore and swollen, am kept in solitary confinement. May God forgive them; they have their own convictions; I am not angry with them, but why do they try to frighten me by stupid examinations? Yesterday I was again taken to be examined. . . . They cannot understand that one can be devoted to science without caring for politics; no, they cannot understand that."

Not until 1920, after many eminent Russian men of science had perished, did the Bolsheviks establish a so-called "science-ration." But even this ration was repeatedly reduced and sometimes entirely stopped.

What is the attitude of scientific men towards the Bolsheviks? This is a very complicated question. If we put aside the personal grievances which everyone now has owing to the grave economic situation, and consider the question from its logical side, we shall see how complicated it is. For example, there is Prof. Gredeskul, who urges the *intelligentsia* to join the Communist party; there is Prof. Behtereff, who declares that all Russian men of science now abroad should return to Russia; there is Prof. Pavloff, the declared anti-Bolshevist. As a general rule, learned men are not Communists; only a few of them have joined the party: Pokrovsky, the late Prof.

Timiriaseff, Gredeskul. I am unable to find any other scientific men who would say "we Communists." A few Communists may be found amongst the young laboratory and lecture-room assistants, but all of them are quite unknown to the outside world; they have no scientific or public standing. The main body of Russian learned men is openly opposed to the Bolsheviks—of course, among them are various shades of opinion, very interesting and characteristic.

Another group of savants, among them many prominent men, hold the view that they must defend the interests of pure science.

As Russian citizens, when we are outside our laboratories and universities, we say: "Down with the Bolsheviks!" They have brought only damage and shame to Russia, and can bring nothing else. But as scientific workers we have another grievance. Russian science, that part of culture which belongs to the whole of humanity, must be saved from annihilation. We, the servants of science, must do all in our power to preserve her in Russia, to save the lives of Russian men of science, to reawaken her creative power in our country. We must, for the sake of science, make concessions to the Bolsheviks; they appoint their commissaries to our laboratories and institutions—we must not object to this measure; they put us under a military *régime*—we must accept even this. We believe, we know, that Bolshevism will soon pass; meanwhile, we will do our best to preserve the eternal human culture. We believe that scientific work is quite possible under Bolshevism, in spite of the Bolsheviks.

They did believe in this, but now their belief is waning, though they are still ready to accept any kind of compromise in order to preserve science and scientific institutions. To this group belong the academicians Oldenburg, Fiersman, Behtereff, Prof. Tarasevitch, Lasareff, Rojdestvensky, and many others.

Then there is the last group of Russian men of science, which embarrasses the other Russian scientific workers. These say:—

We are far removed from politics. We do not believe in the Bolsheviks; we do not consider them to be either idealists or revolutionaries; we consider them as men who seized the State power by main force and now are willing to govern the country by force. They suppress every movement towards freedom; they cannot endure any independence apart from themselves, because they are afraid that the freedom and independence of the people will ruin Bolshevism. We do not believe in the Bolsheviks. We were witnesses of the appeal of Lenin to the intellectuals when he asked them to collaborate with the Bolsheviks. That was a year ago. But what did Lenin mean by "collaboration"? To be his lackeys? To carry out his orders? We were witnesses that this same Lenin, who in April asked the intellectuals to collaborate, in May shot many hundreds, and even thousands, of educated people. Why?

No, we do not believe in the Bolsheviks.

Such is the theory and the practice of the "proletarianisation of science": in theory—the peaceful reorganisation of science; in practice—its destruction, its exploitation for political purposes.

At this stage of Russian life two principles are

struggling in the most fateful way: one, which unites synthesis and analysis, which seeks the truth of to-morrow, which has nothing to do with politics and political parties; the other, which is entirely subjective, full of personal ambitions and views, which is devoid of analytic conceptions, and is born of the evils of to-day.

Science is struggling with politics for its freedom; politics is struggling with science for its triumph. It is a struggle which, alas! human

history has witnessed many times, but which has always ended in victory for science. It did seem that this useless struggle would not have to repeat itself again; yet now the fierce combat is going on in Russia; the old times of the Middle Ages have once more returned on the earth. The Bolsheviks are repeating in many ways the long-forgotten past, though they themselves are convinced that for the first time they are propagating a new creed.

Physical Effects Possibly Produced by Vision observed by Dr. Russ.

By DR. H. HARTRIDGE.

THE rise and fall of scientific theories forms a topic for study almost as interesting as does the supersession in history of one dynasty by another. Newton's corpuscular theory of light was displaced by the wave theory in much the same way as the teaching of Aristotle supplanted the older view of Plato—that in vision emanations proceed forth from the eye to strike the objects looked at. But just as modern physical research has revived certain aspects of the corpuscular theory, so the researches of Dr. C. Russ ("An Instrument which is Set in Motion by Vision or by Proximity of the Human Body," *Lancet*, July 30, p. 222) have recalled to memory the views of Plato. For these researches have shown that certain instruments react when the human eye is directed at them.

One instrument used by Dr. Russ consisted of a solenoid suspended by a single fibre of unspun silk within a case composed partly of glass and partly of metal, in such a way that the contents were shielded from air-currents. Above the solenoid was mounted a small permanent magnet, so that the suspended solenoid set itself in a constant meridian under the earth's magnetic field. In another instrument the solenoid was replaced by a condenser, oppositely charged metal plates being mounted outside the instrument-case. With both instruments it was shown that a rotation of the suspended system occurred when the gaze was suitably directed through a slot in the outside casing. As to the precise details of the rotation, the description is not very clear, but it seems that when the gaze was directed to the centre of the suspended system no rotation occurred; when, however, the gaze was directed on either side of the system, then that side rotated away from the eyes some 10 to 45 degrees, and then again came to rest. If the gaze continued to act, the deflection remained unaltered; but if the eyes were then closed, the index returned to zero.

In earlier experiments the rotation of the instrument was directly observed by the human eye; later, however, the instruments were fitted with concave mirrors similar to those applied to reflect-

ing galvanometers, so that the rotation could be measured in the ordinary way by the movement of a spot of light on a scale. Besides demonstrating that rotation of the instruments occurred under the action of the gaze, Dr. Russ also found somewhat similar effects if the fingers were held near the instrument.

Nothing definite is known at present as to the explanation of these effects, but Dr. Russ made the following preliminary alternative suggestions:—

1. That the effects are due to changes of temperature.
2. That they are due to the electrical changes which accompany vision and muscular action.
3. That electrostatic forces are responsible for them.
4. That the eye may emit electromagnetic waves (*e.g.* visual, infra-red, ultra-violet, and X-rays).

With regard to the above suggestions, it may be said that temperature changes are not likely to be the cause, for hot objects placed in suitable positions near the instruments produced either no effects, or effects very much smaller than those producible by eye or hand. Electric changes produced in muscle or in eye can, I think, be safely ruled out, because of their smallness and because of the closed circuits which the connective tissues, skin, etc., form over them. To demonstrate or to measure these currents, the retinae or muscles must themselves be connected to the leads of the galvanometer. Dr. Russ apparently ruled out the possibility of electrostatic changes being responsible, by finding that the directing of the gaze through a fine metal grid connected to earth (which would screen off electrostatic charges) did not prevent the instruments from reacting to the gaze as usual.

Lastly, in favour of the effect being an optical one (I intend X-rays to be included) are the following facts found by Dr. Russ:—

1. That interposing a column of water between the eye and the instrument reduced the effects.
2. That the effects are very much smaller, or