LETTERS TO THE EDITOR.

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The Place of Science in Education.

THE memorandum regarding the neglect of science to which you refer in your leading article last week fails in my judgment by its moderation. The proposal that at least as many marks in the Civil Service examinations shall be allotted to science as to classics, may be a step in the right direction, but it is a halting one, for it affects only a limited class of the community and does not insist on the *paramount importance* of science in general education. What should be stated is not the least, but the whole of what is necessary. What ought to be made clear is that science must form not a mere adjunct but the actual foundation of the education given in secondary schools. In a word, what is wanted is a *revolution* in our educational system.

Unless the public appreciates the necessity for the change no such revolution is possible; when it does, the mechanism of converting the proposition into action will be simple. If the democracy once understands that we have no chance of keeping our place in the sun unless we are prepared to recognise that whether in peace or war science must be the dominant factor in education all difficulties will disappear. But if this idea fails to take root our place will be lost; and such a place once lost can never be regained. The revelations which have come to light in the course of this bloody war will, we hope, do at least this good, that the people may be induced to appreciate the necessity of basing education upon natural science instead of upon the classics.

The appointment of a Minister of Science which is advocated in the memorandum would under existing conditions be of little use. Whatever qualifications he might be selected for, we may safely prophesy that entire ignorance of the subject he is to administer would be one. It might, however, be argued that this would be a useful asset, for he would at least be gloriously impartial in the various branches of science which would come under his administration.

E. A. SCHÄFER.

University of Edinburgh, February 14.

Relations between the K and L Series of the High-Frequency Spectra.

KOSSEL has shown that for the K and L lines in the high-frequency spectra the following relation holds good :—

$$\nu_{L\alpha} = \nu_{K\beta} - \nu_{K\alpha}$$ where ν is the frequency.

This relation is deduced on the assumption of the Bohr-Rutherford's atomic model. As the result of new measurements, J. Malmer in his inaugural dissertation, Lund, 1915, states that the K series consists of four lines, called α_1, α_2, β_1, β_2, and that Kossel's relation must take the form—

$$\nu_{L\alpha} = \nu_{K\beta_1} - \nu_{K\alpha_2}.$$

An investigation of the spectra of the L series, which has been carried out by E. Friman and the writer, has shown that there is in reality an additional line near the $L\alpha$, with a slightly greater wave-length. Further, the L series contains two lines, called by Moseley the β and γ lines, which I will denote by β_1 and β_2, as they seem to be a doublet. The ϕ lines observed by Moseley are probably due to some impurities, as they fit fairly well in a series if they are ascribed to other elements. For antimony, we have, according to Malmer, the following relative results :—

		λ		ν
$K\alpha_2$	...	0·472	...	2·119
$K\alpha_1$	...	0·468	...	2·137
$K\beta_1$	...	0·416	...	2·407
$K\beta_2$	...	0·408	...	2·451

From this we get :—

	ν	λ calculated	λ for L series measured
$K\beta_1 - K\alpha_2$	0·285	3·51	3·46 = α_1
$K\beta_1 - K\alpha_1$	0·267	3·74	[3·7] . . α_2
$K\beta_2 - K\alpha_2$	0·332	3·01	[3·06] . β_2
$K\beta_2 - K\alpha_1$	0·314	3·18	3·25 β_1

The values in the last column are those given by Moseley for $L\alpha_1$ and $L\beta_1$, and the values for $L\alpha_2$ and $L\beta_2$ are extrapolated.

MANNE SIEGBAHN.

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January 1.

Educational Work in Museums.

IN view of the decision of the Government to close the national museums and art galleries and its probable influence on those responsible for provincial institutions of the same kind, it would perhaps be useful to direct attention to its effect on a branch of museum work which has been started in Manchester as a direct result of the effects of the war.

Owing to the taking over of their buildings for military hospitals, several schools in the Manchester district found themselves temporarily without homes. In order to meet this emergency, the education authorities have instituted what might be termed a half-time system in certain of the remaining schools in order that the scholars from the dispossessed schools should have at least some instruction. The problem then arose of what to do with the scholars for the other half of their time. The Museum Committee was consulted, and asked what help it could render in the emergency, and the keeper of the museum, in consultation with the education authorities, drew up a scheme under which the scholars are now receiving instruction in natural history and Egyptology in the museum buildings.

The education authorities appointed two teachers, already on their staff, to take charge of the work at the museum, one to teach biology and the other geology. The committee placed two rooms at the disposal of the teachers and provided them with duplicate specimens from the reserve collections which could be used and handled freely by both teachers and scholars.

Courses of lessons in geology and natural history were drawn up by the teachers in consultation with the staff of the museum, framed according to the time available and the number of scholars to be dealt with.

Eight classes—of one hour's duration—are held daily, four by each teacher: two in the morning and two in the afternoon. Each lesson consists of from thirty to forty minutes' instruction in the classroom, followed by a tour of the cases in the museum dealing with the particular subject taught, and each course consists of about nine lessons.

In addition to the instruction in natural history the assistant in charge of the Egyptian department gives short courses of lessons in Egyptology to school classes, and four such classes are held weekly.