your attention to the fact that we found *inversions*, as they are now called; that is to say, to take an instance, if we represent three lines of a spectrum by *a*, *b*, and *c*, we have found among the most widened lines in spots *a* without *b* and *c*, *b* without *a* and *c*, and *c* without *a* and *b*. Now that is a condition of things impossible to understand or explain on the old view.

We next continued the discussion over another region of the spectrum, and we found that the result held absolutely good, that is to say, in other regions we got these same inversions. If we look at a map belonging to another period, although the lines change, the inversions remain, and the lines behave very much in the same way as the other. This result is quite constant for all regions of the spectrum examined. Hence, finally, we learn that these inversions hold good for different periods, and for different parts of the spectrum; and we have found that spectroscopically any one vapour in the spots behaved in exactly the same way as various mixtures of many vapours would be bound to do.

The result of this inquiry with regard to chemical substances which have been most carefully worked out, is indicated in the accompanying table, giving the result of the work for two years from 200 spots.

Statistics of the most Widened Lines seen in 200 Sunspots at Kensington

	Total number of lines in part of spectrum discussed	Total number of lines widened
Iron	172	72
Titanium	120	38
Nickel	24	9
Zinc	19	5
Cobalt	17	3
Calcium	17	7
Chromium	15	9
Molybdenum	14	1
Tungsten	14	2
Manganese	13	4
Platinum	12	1
Barium	10	1
Copper	10	1
Sodium	7	2

In these 200 spots out of 172 lines of iron which we might have seen only 72 were observed altogether; out of 120 lines of titanium which we might have seen only 38 were seen; and then the number goes on decreasing: 24 in the case of nickel, of which 9 were seen; 19 in the case of zinc, of which 5 were seen; 13 of magnesium, of which 4 were seen; 12 of platinum, of which 1 was seen, and so on.

The final upshot is, therefore, that at the spot-level we do not see the Fraunhofer spectrum, as we ought to do on the old theory. What we do see is a small percentage of the lines, and we see them under conditions which are entirely unexpected. No one, I think, who knew anything about spectrum analysis would have anticipated the result which we have got at Kensington in these 700 observations.

These, though the earlier results, are not the only results which we may hope to get by going on with the work. At present we have limited ourselves to recording the dates of the spots. But this is not enough; we must know the actual positions of the spots on the sun. We must note whether each particular spot is in the northern hemisphere or in the southern hemisphere, with the view of determining whether there is any chemical difference between the north part of the sun and the south part; and then again we shall have to compare the latitudes of spots, with the view of determining whether there is any difference in the chemistry of the spots according to the latitude. I may tell you that we are working at that particular point just now, and it really does look as if the sudden changes in the spectra recorded may have been due to the fact that the spots compared were spots varying very considerably in latitude, and it would not surprise me to find that spots which are very like each other in their spectra will be found to be situated more or less in the same degree of latitude,—whether the same degree of latitude north or south we do not know. And there is another question, too. I pointed out that there is a considerable number of lines seen in the spectrum of the arc which are left out of the spectrum of the spark. Now, will that help us at all in our inquiries? I think perhaps it may. Everybody assumes that the electric spark is hotter than the electric arc. If that be so, the lines which we see at the temperature of the arc, and which we do not see at the temperature of the arc only, may represent the lines due to cooler vapours—more complex molecular groupings it may be, which can exist in the cooler temperature, but which entirely break up on the application of a higher one. If that be so we shall be able to sort out the spots more or less according to their temperature.

Though the results have not been shown on the maps, the lines visible in the spectrum of some substances at the temperature of the oxy-hydrogen jet have been observed. Everybody assumes that the temperature of the oxy-hydrogen jet is lower than the temperature of the electric arc or spark; so that, if we can get a spot which gives us those lines thickened only which we see at the temperature of the oxy-hydrogen jet, we should be perfectly justified, I think, in saying that that was a relatively cool spot; whereas, if we saw a spot which only had those lines thickened which are intensified on the passage from the temperature of the arc to the temperature of the spark, we should be justified in saying that that spot was very much hotter. I only throw this out as an indication of the kind of result which probably future working and future thought will bring out, and that we are by no means at the end of the work yet.

J. NORMAN LOCKYER

(*To be continued.*)

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—The new Medical Statute was finally approved by Convocation on March 16. The scope of the new Statute and its bearing on the study of medicine at Oxford were so clearly described by Prof. Burdon-Sanderson in last week's NATURE, that it is unnecessary to refer further to them. One point insisted on by the Professor, that the present student of medicine wastes his first year over Pass Moderations, has not yet been corrected. The Moderations Committee are still deliberating, but there seems little doubt that students of Natural Science in Oxford will receive substantial relief under the new scheme.

The present year is one of reform. While the Moderations question is still under debate, a new and much-needed reform has been sprung upon the University. The old Examination in the Rudiments of Faith and Religion has by common assent become out of date. Last week the preamble of a new Statute was passed *nemine contradicente* in Congregation. We must wait till next term to learn the fate of the Statute itself. It seems time that the University should grant degrees without demanding an intimate knowledge of the Thirty-nine Articles.

CAMBRIDGE.—It has been decided to establish a Tripos Examination in Engineering, to be combined with the present Natural Sciences Tripos. The general basis is that, as an alternative to the present First Part of the Tripos, an examination in certain mathematical subjects useful in engineering, physics, chemistry, and theory of structures shall be held, to be followed by a practical examination. Those who pass this will be entitled to a degree in honours. A later examination, concurrent with the second part of the Natural Sciences Tripos, is to consist of advanced papers in Physics, Chemistry, and Engineering, distinction in one or more of which is to entitle a student to a first class. When the complete scheme is published we shall give full details.

SCIENTIFIC SERIALS

The Journal of Physiology for November 1885, vol. vi. No. 6, contains:—On a double differential rheotome, by Dr. W. D. Samways (plate 7). The instrument is described and figured.—On the blood of Decapod Crustacea, by Dr. W. D. Haliburton (plate 8). Assisted in part by a grant from the British Medical Association, the author has studied the blood in the lobster, the edible crab, the crayfish, Astacus, and *Nephrops norvegicus*; and he treats of its colour, constituents, and coagulation. He ascribes the clot as due to the formation of a body scarcely to be distinguished from the fibrin of vertebrate blood, and believes that its formation is due to a ferment action, which latter is derived from the amœboid corpuscles of the blood. At the close of the memoir the author treats of the comparative aspects of crustacean

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