

It seems preferable to say that the regions where calcium exists correspond to those regions where hydrogen is absent than to say that the bright calcium flocculi resemble in form the dark hydrogen flocculi.

To show the confusion to which such a form of description as the last mentioned can lead one, a good instance is given on Plate viii., Figs. 3 and 4, of Prof. Hale's publication. There are shown two illustrations of the same region of the sun, one taken with the calcium line (K_2), and the other with the hydrogen line ($H\beta$). On each of these there is a peculiarly shaped *dark* patch, evidently the same region on the solar disc, and the photographs show that in this region neither calcium nor hydrogen is present. According to Prof. Hale's notation, this patch should be called both a "dark calcium" and "dark hydrogen flocculus"! As a matter of fact, the marking might be due to quite another substance altogether, and although it appears dark when analysed with either

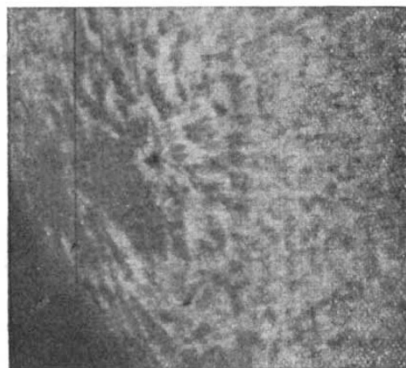
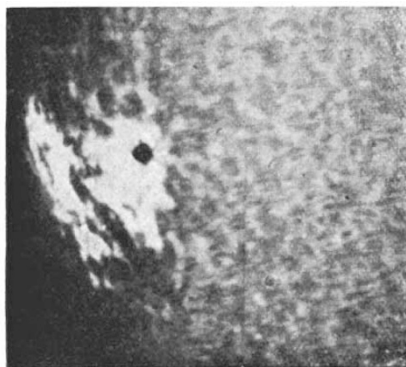


FIG. 6.—Two photographs of the same region of the solar disc taken on the same day, showing that where the bright calcium flocculi are present (upper photograph), the bright hydrogen flocculi (lower photograph) are absent.

the calcium or hydrogen lines, it might appear as a "bright flocculus" if a line in the spectrum of the substance of which it is composed were used. Thus if at the particular levels at which the photographs were secured we knew that helium had been present in this region, then it would have been shown on the photograph as a dark patch if the calcium and hydrogen lines had been employed, and as a *bright* one if any of the helium lines had been isolated by the secondary slit.

Enough, perhaps, has been said to indicate that what is meant by the "dark hydrogen or calcium" flocculi is not quite clear.

The fact brought out by the beautiful series of photographs of Prof. Hale, that when the bright calcium

flocculi are absent the bright hydrogen flocculi are present, raises a number of important points in solar physics which the spectroheliograph alone at the present time can attempt to solve.

Calcium and hydrogen are not, however, the only substances which exist in the solar atmosphere. How are the other materials distributed? The comparative thinness of the lines of these other substances in the solar spectrum makes it more difficult to analyse their distribution over the solar surface, but nevertheless possibly many of the strongest lines may yet be analysed.

It will thus be seen that the new spectroheliograph in the hands of Prof. Hale and his co-worker, Mr. Ellerman, has opened up a new field of research which apparently has no limit. The facts that the sun is continually changing in activity and that the sky in any particular place is not always clear point out that for the study of the distribution of any particular element on the disc, one spectroheliograph at one station is not sufficient. Just as in the case of sun-spots, three stations, widely separated, are required to produce a nearly daily record, so with this new instrument the same number of stations would be required for the study of one element. For the complete study of several elements, it will be seen, numerous instruments will have to be employed if every advantage is to be taken immediately to begin to gather the necessary material.

So important is it that this new instrument for solar research should be employed to tell us of the changes that are taking place in the sun from day to day and from year to year, that no time should be lost in constructing a sufficient number of them, in distributing them where the raw material, sunlight, can be most often procured, and in organising a homogeneous plan of campaign.

When it is considered that a study of the solar changes is vital for the clear understanding of the numerous terrestrial variations which are so closely associated with our everyday life, the necessity of such a programme is obvious.

Just as in the case of the charting of the heavens, so this work should be of an international character, for every country would be able to reap equally the benefits which such an organisation would bring.

The Rumford spectroheliograph of the Yerkes Observatory having thus shown the exceptional value of this new method of solar research in the hands of Prof. Hale and Mr. Ellerman, future workers will find their task very much lightened by a study of this magnificent and epoch-making contribution to solar physics. It is satisfactory to note that for this work in particular among other valuable contributions to astronomy by the same author, the Royal Astronomical Society has this year awarded Prof. Hale its gold medal.

WILLIAM J. S. LOCKYER.

COMMEMORATION DAY AT THE UNIVERSITY OF GLASGOW.

ON Tuesday, April 19, many of us were thinking of the Kelvin jubilee, which attracted the foremost scientific men of Europe here in 1896. It is only a fortnight since the body of graduates unanimously elected Lord Kelvin to be our academic chief. In 1901 the university celebrated the ninth jubilee of her own foundation. On April 19 she inaugurated an annual commemoration day.

The ceremony opened with a snort religious service. After it Sir William Ramsay, who began his great career as a chemist here, discoursed on Joseph Black—the most famous chemist who has been connected with

Glasgow. Black was made professor in 1756, when he was twenty-eight, and remained here until he was translated to Edinburgh ten years later. Prof. R. Dundas Thomson wrote fifty years ago of Black, "These two capital discoveries"—of the loss of weight when limestone is converted into quicklime, and of the disappearance of an amount of heat which does not affect the thermometer when water is converted into steam—"have been of greater service to science than perhaps any equal number of data ever pointed out by philosophers. Dr. Black was a man of elegance, modesty, and indolence. His active life in science terminated in his thirty-eighth year, for after his removal to Edinburgh, he engaged in no inquiries, and contented himself with teaching the science." Some scientific men may look back with regretful eyes to the far-off Arcadia of their great predecessor—who had two epoch-making discoveries to his credit before he was thirty-eight, and nothing but quiet though admirable teaching to do for the balance of his days. Mendeléeff at seventy, and Lord Kelvin at eighty, are still incessantly at work on the most abstruse and far-reaching problems of the intimate constitution of the world. Dr. Black's incisive critic might have remembered that it has been given to very few men of science to take an unchallenged place both among the first investigators and the most accomplished and successful teachers of his time.

Wandering, after the lecture, about the university, which our predecessors in 1870 thought to have been housed so splendidly, one finds Sir Gilbert Scott's great central building surrounded by masses of modern additions. There is a huge engineering building which cost about 30,000*l.*, a botany building costing about 18,000*l.*, an additional anatomy building costing about 13,000*l.*, an additional surgery building costing about 10,000*l.* All these were built within the last ten years, but before the days when Dr. Carnegie stepped in like a special providence to help the Scottish universities. His benefactions are of two kinds. The first provides 50,000*l.* a year towards the payment of the fees of all students in any of the universities who ask for it and who have shown themselves qualified to profit. It was no doubt hoped that this would largely increase the number of the students, and so greatly add to the resources of the universities. The hope has hardly been realised. The number of students has not materially increased, and the universities merely receive the fees of a very large number of their students through Mr. Carnegie's trustees instead of from the parents. Many students, of course, do not ask for this benefit, but, as a very great number do, the fee money which Mr. Carnegie has provided goes, and no doubt it was to a great extent meant to go, to the relief of parents who used to pay, often, certainly, with difficulty, and it has made very little addition to the resources of the universities. It is by the second 50,000*l.* a year, destined for equipments and extensions, including buildings, that the universities have chiefly benefited. The trustees require that the university wanting new buildings for scientific teaching shall raise half the requisite money, in which case they will supply the other half. For some reason or other they have not so far helped the extensive addition—costing probably 12,000*l.*—which has just been made to the chemical department. But they are defraying half the cost of the new buildings for natural philosophy, for physiology, for medical jurisprudence and public health, and for *matéria medica*, which are all in a state of considerable forwardness, and which will cost some 80,000*l.* The scientific world must have laboratories for practical teaching, and modern laboratories are expensive to build, and very expensive to maintain and to keep up

to date. There is no more finality in scientific equipment and apparatus than in ironclads, and many things which are imperious necessities of to-day will be historic scrap iron after a dozen years. These vast laboratory extensions will be useless without great additions to the staff, and the universities will have to look not merely to the Carnegie trustees, but to the general public for further advances towards maintenance and renewal of equipment. Scientific students in Glasgow and elsewhere ought in the future to be taught more practically, but it is by no means certain that their numbers will be greatly increased. It is certain that there are many non-scientific departments which will need extensions, and cannot look to the Carnegie trustees.

I have perhaps wandered a little from the commemoration, but it is in these visible extensions actually or prospectively completed within ten years through the benevolence of Glasgow donors and the generous help of the Carnegie trustees that scientific graduates and visitors have taken the greatest interest. After their look round, they betook themselves to the Hunterian Museum, where a medallion bust of the late Prof. John Young, who was its *genius loci* for thirty-six years, was unveiled. No archæologist, numismatist, zoologist or geologist can be ignorant of his name and work. "Those who knew him best," says his life-long friend and comrade, Dr. Yellowlees, "know that they will never see another John Young."

The commemoration day is now over. It included the ceremony of conferring honorary degrees, six D.D.'s and eight LL.D.'s, including Mr. Choate, the American Ambassador, and—in *absentia*—Prof. Mendeléeff, the great Russian chemist, perhaps the foremost man in modern chemistry, and the fittest to connect the chemists of this generation with the brilliant young Glasgow professor of a century and a half ago whom the great Lavoisier was proud to acknowledge as his teacher. Mention must, however, be made of the banquet in honour of Sir William Ramsay, whose Glasgow degree is not of yesterday, and of the honorary graduates of to-day. But banquets are, after all, very much alike. W. J.

THE CELEBRATION OF SIR HENRY ROSCOE'S GRADUATION JUBILEE.

THE half-century which has elapsed since Sir Henry Roscoe graduated as doctor of philosophy at Heidelberg has been devoted by him uninterruptedly to the furtherance of science and education.

As professor of chemistry for thirty years at Owens College, he succeeded by his teaching, writings and researches in establishing a great school of chemistry, besides earning a world-wide reputation as a scientific man; as member of Parliament he assisted to lay the foundations of a scientific system of technical education; and as Vice-Chancellor of the University of London and a member of the Carnegie trust and other bodies, he has spent his later years in the organisation of scientific teaching. It was therefore fitting that at the celebration of his graduation jubilee he should be greeted by addresses from his old students and from universities, colleges, and learned societies, both at home and abroad, which bore eloquent testimony to the intense appreciation which is felt for his services to the cause of scientific and educational progress.

The ceremony took place on Friday last, April 22, at Manchester, in the Whitworth Hall of the Owens College, which, by its great architectural beauty, sets a fitting seal on the splendid group of buildings which Sir Henry Roscoe has seen grow up to replace the old house in Quay Street in which his first classes were held.