references in the reports of the British Association Committee on Meteorological Photography and other places.

So long ago as August, 1889, I had shown conclusive proofs that the phenomenon was not due to any difference in the refrangibility of the light of the spark and that of the reversing light. I showed that the light of the sparks themselves could effect reversal of the images of others. Perhaps I may be allowed to quote from the paper.

"A plate was then exposed in the camera to a series of sparks, then to the direct light of more sparks without the interposition of the lens, and finally to a second set of sparks. The images of the first set show reversal while those of the second are direct.

"Next a plate was exposed to one set of sparks and without removing it from the camera the light of some more was diffused by holding a sheet of ground glass in front of the lens. Finally a second set of sparks was photographed. The results were similar."

These two experiments enabled me to reproduce the phenomenon of a bright flash crossing a dark one, and the reversal of one flash by the diffused glare of another.

In the second place plates were exposed to a number of spark images and then to a tolerably pure spectrum. The result was reversal in all parts, and by varying the length of exposure to the spectrum it was shown that the reversing power was simply proportional to the direct actinic power, maximum reversal occurring when the direct actinic effect of the reversing light was equal to that of the spark images. I was, therefore, entitled to sum up thus:

"Differences of refrangibility, therefore, do not seem to lie at the root of the matter. Neither can a difference of intensity be the cause of the reversal, for the less intense the light of the spark the more easily is its image inverted. It seems to me that the extreme shortness of the exposure to the electric spark may be the explanation."

A similar conclusion was indicated by the fact that the image of a spark very much out of focus did not lose the property of reversibility.

But how were we to account for the experiments showing that the spark images could be reversed by the light from other sparks? Was it possible that objects illuminated by these reversing sparks (card, objects in the room or ground glass) reflected or modified the light sufficiently to change its action on the photographic film?

I also tried to imitate the phenomena by brief exposure to other luminous objects trying in turn slits illuminated by gas, lime-light, magnesium and sunlight. I had no arc lamp available then. Here Professor Wood has done better, my results were nil and I congratulate him on his success.

However I should like to suggest that it is just possible that light from a source whose excitement is electrical *may* differ from other kinds of light in some manner at present unknown and that it is not safe to regard it as proved that the time element is the only one involved until the phenomena have been repeated without employing electricity at all.

For ten years the facts have been before the world. They were partly verified eight or nine years ago by Mr. Shelford Bidwell and it is highly satisfactory to find them verified again in so many particulars, by another physicist who has reached the same conclusions by means of somewhat different experiments.

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Sociology and Psychology.

To the Editor of Science: The relation of sociology to psychology suggested by Professor F. H. Giddings in his article, 'Exact Methods in Sociology' (*Popular Science Monthly*, December, 1899), is so misleading that it demands a word of protest from the psychologist. We must regard it as a capital mistake when any sociologist tries to make his science a means of measuring psychological quantity. Thus, when Professor Giddings (p. 155) would measure the 'intelligence' of societies by comparative statistics of literacy, for instance, he overlooks such facts as these: that mere reading, like talking, signifies little—the main point being what is read, whether Hegel or the yellow journal—and that how much is understood

must be measured. Some exceptional reader in a community may exceed in intelligence the sum of intelligence of all other readers, and even some illiterate may go beyond a number of literates. Hence only by the special study of individuals, and adding the results, can the sum total of intelligence for any community be found. But this is the task of psychology, not sociology, whose field is objective fact, social actualities like illiteracy, crime, etc., and their concomitant variations. Sociology can determine how many people read, and what they read, and the concomitant variation between the circulation of yellow journals and increase of crime; but it cannot measure the intelligence or the emotion implied, for the psychical illumination of social phenomena can come only from psychology.

HIRAM M. STANLEY.

LAKE FOREST, ILL., December 2, 1899.

NOTES ON INORGANIC CHEMISTRY.

A PECULIAR interest attaches to ammonium cyanate from the fact that it was the spontaneous conversion of this salt into urea, which first bridged over the gulf between the inorganic and organic, and in the hands of Wöhler gave the great impetus to the study of organic chemistry. Owing to its instability it has been very difficult to prepare ammonium cyanate in a pure condition. It is shown, however, in the *Proceedings* of the Chemical Society (London), by J. Walker and J. K. Wood, that the substance may be readily formed by mixing the cooled solutions of ammonia and cyanic acid in ether. It is also formed when the vapors of ammonia and cyanic acid are brought into contact, provided the reacting gases are sufficiently diluted with some indifferent gas. The transformation of solid ammonium cyanate into urea is facilitated by heat and very greatly accelerated by presence of moisture.

IN the same Journal, G. Dean describes a new series of atomic weight determinations of nitrogen. They are peculiar in their use of silver cyanid as the salt analyzed. The other atomic weights involved are those of potassium and bromin, hence the accurately determined Stas figures were available. The value found was $N = 14.031$ which is somewhat lower than the weight accepted by Clarke 14.04, and that by Richards 14.045. $(O = 16)$.

IN a recent number of the *Comptes Rendus*, Moissan has described the formation of ozone by the decomposition of water by fluorin. If the temperature of the water into which the fluorin is led, is kept at or below zero, it is possible to get over 14 per cent. ozone (by volume) in the gas over the water. Moissan points out the possible practical application of this method, for though the electrolytic production of fluorin from hydrofluoric acid is still a rather difficult operation, it is not an expensive one. The ozone formed in this process has the advantage of being completely free from the oxides of nitrogen.

OF late years several explosions have taken place in factories where aluminum-bronze powder is ground. Investigations as to the cause of these explosions have been made by Stockmeier, and are reprinted in the *Chemical News*. The powder is perfectly stable, but its mixture with potassium chlorate will detonate even by rubbing. Bronze in contact with water decomposes it forming hydrogen, and it is to the presence of the hydrogen that explosions are probably due. The powder is hygroscopic and the dry powder can absorb 1.4 per cent. moisture from the atmosphere. Then in grinding up five or six kilos of bronze powder there could be moisture enough present to generate forty to fifty liters of hydrogen. A series of precautionary rules is proposed, the most important of which require dryness and absence of dust in the air about the grinding machine.

PROFESSOR E. T. ALLEN of the Missouri School of Mines calls attention in the *Chemical News* to a curious case of corrosion of gold plated weights which had been put away for the three summer months in a safe. The weights were covered with a white substance which proved to contain zinc and to be largely organic. The suggestion is made that the corrosion was caused by mould, the gold plating being, perhaps, not completely impervious, and the most positive metal, zinc, being removed from the brass. It appears to be well established now that certain hard waters have the property of dissolving the