required to remove both electrons from Mg, but the work necessary for the removal of the first electron (and consequently for the second) in the case of the molecules is quite different from that for the atom. So far as I can see now, none of the results are inherently unreasonable or in conflict with the present experimental data, and I hope to consider them in detail in the full report of this work.

I have had the benefit of consultation with the many persons in this University who are interested in these problems, and also of much correspondence with Dr. Mulliken. I am especially indebted to Dr. Sponer and to Dr. Mulliken for helpful suggestions.

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University of California,
December 19, 1925.

### Effects of Polarised Light on Bacterial Growth.

DURING recent years certain biochemical effects of polarised light as compared with ordinary light have been brought into prominence by Dr. Elizabeth Sidney Semmens (*Journ. Soc. Chem. Ind.*, 42, 954, 1923; also *Bri. Assoc. Rep.*, 1923). She has shown that the hydrolysis of starch proceeds with greater rapidity in polarised light than in ordinary light of the same intensity, all other conditions being identical.

In biological studies of bacteria specially with reference to their pathological and epidemiological significance, heat and various other physical conditions such as humidity, etc., have been put up as factors of fundamental importance. So far as the authors are aware, however, very little attention has been paid to the effects on these aspects of bacterial life of the variations of luminous radiations in Nature. The amount of polarisation of light, as is well known, being subject to marked variations not only from season to season and country to country but also during different parts of the day and night, it occurred to the authors to investigate as to how the bacteria would react to polarised light.

So far preliminary experiments on the growth of *V. Choleræ* and *B. typhosis* (strains obtained from Kasauli) have been tried. The results obtained were so interesting that it was considered desirable to communicate them without delay.

Emulsions of young *V. Choleræ* and *B. typhosis* cultures in Dunham's solution and nutrient broth respectively were prepared and thoroughly shaken in a mechanical shaker. Equal amounts of the uniform emulsions so obtained were exposed for a definite period to polarised and unpolarised light of equal intensity in two compartments of a sterilised optically correct cell ordinarily used with a Rayleigh interference refractometer manufactured by Messrs. Adam Hilger. The source of light for both the polarised and the unpolarised beams was a hundred-candle-power half-watt lamp from which two beams of light were obtained by means of a parallelising device. The polarisation of one beam was effected by interposing a Nicol prism in its path, and the intensities of the two beams were equalised by means of glass plates. To test the intensities of the two beams of light, the deflexions produced in a Broca's galvanometer were compared when a Rubens linear thermopile connected to the galvanometer was placed at equal distances in their paths.

The difference in the turbidity of the two compartments after exposure was taken as an index of the difference in their bacterial content. The turbidities were determined by exposing the two compartments successively to a standard source of light (6-volt half-watt Mazda lamp) for half a minute and measuring the intensities of the light, after passing through the cell, by means of the thermopile and Broca galvanometer arrangements described above. The results so obtained were confirmed by plating out 0·5 cc. of the contents of the two compartments on agar and counting the number of colonies in the two cases after forty-eight hours' incubation at 37° C.

Some of the results are shown in the table below. The observations were made at room temperature.

| Type of Organism. | Duration of Exposure. | Deflexions of the Galvanometer. | | Colonies on Agar. |
|---|---|---|---|---|
| | | Compartment exposed to polarised light. | Compartment exposed to unpolarised light. | |
| *V. Choleræ.* 24 hours' growth on agar emulsified in Dunham's solution | 2 hours | 0·80 cm. | 1·10 cm. | |
| Do. | 14 ,, | 0·90 ,, | 2·60 ,, | |
| *B. typhosis.* 24 hours' growth in broth | 5½ ,, | 0·80 ,, | 1·15 ,, | Innumerable in both. Distinctly larger number in the case of the compartment exposed to polarised light. |
| Do. | 21 ,, | 0·70 ,, | 1·25 ,, | |

These results suggest that the polarised light favours bacterial life as compared with ordinary light of equal intensity.

What rôle the reactions of polarised light on the binomics of the bacteria—free in Nature, in water and in the body of the carrier—play in the mechanism of their pathogenicity and epidemicity seems to involve large issues and is a subject worthy of consideration. It also suggests problems regarding the reactions of polarised light on the physiological and pathological processes in the body of the host which may throw some light on questions such as the afternoon rise of temperature in normal individuals and in certain fevers. Work on some of these problems is in progress.

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### The Nature of Active Nitrogen.

LE problème de l'azote actif a donné lieu récemment à un certain nombre de travaux. Dans un article récent (*Zeitsch. f. Phy.*, 84, 622, 1925) Dr. Sponer reprenant les premières idées de Strutt, émet l'hypothèse que l'azote actif est de l'azote atomique (voir aussi R. T. Birge, NATURE, 117, 81, 1926).

J'ai déjà montré (*C.R.*, 178, 1966, 1924.—Thèse, Paris, 1925, ou *Ann. de Phy.*, sept. 1925) que cette explication des propriétés chimiques et physiques de l'azote actif est la plus simple et la plus logique. Il semble qu'une seule difficulté fasse hésiter les spectroscopistes à admettre l'hypothèse atomique. Au cours de l'activation et de la neutralisation, l'azote n'émet que des spectres de bandes à l'exclusion de tout spectre de raies. Or il est généralement admis que les spectres de bandes ne peuvent être émis que par des molécules polyatomiques. La présence d'atomes dans l'azote actif paraît, dans ces conditions, assez peu vraisemblable. Ainsi s'explique que plusieurs physiciens, à la suite de Saha et Sur (*Phil. Mag.*, 48, 431, 1924) n'aient voulu voir dans l'activation de l'azote qu'une transformation, sans dissociation, de la molécule diatomique en une forme métastable de niveau énergétique élevé.