

could be made without difficulty by ordinary Dunlop rubber solution diluted with carbon tetrachloride.

The rubber balloons imported for pilot and sounding balloon work have been found to deteriorate very rapidly in India in spite of storage in the cold; and the adoption of 'Vulpro' tissue has been of great advantage for the development of upper air work in India. No special storage seems necessary, and the tissue, even a year after its manufacture, seems scarcely to deteriorate in quality. The percentage of premature bursts in case of the 'Vulpro' rubber balloons is almost negligible; hence they have been of immense service for ascents where risk of failure cannot be taken.

As an illustration of their performance, it may be mentioned that balloons  $2\frac{1}{2}$  ft. in diameter made of tissue 0.004 in. thick and weighing about 150 gm. have taken Dines's meteorographs with accessories weighing 110 gm. up to a height of 20 km.

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Oct. 24.

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#### Electric Charge in its Relation to Complement Fixation.

ALTHOUGH the effect of specific immune serum, in the presence of a suitable electrolyte, in reducing the charge carried by bacteria has been thoroughly investigated, no work has been done on the relation of electric charge to complement fixation.

We have been studying this and other allied problems during the last two years and have shown that although sensitisation of red cells takes place in the absence of an electrolyte, specific hæmolysis cannot occur unless the charge of the red cells is reduced. For this an electrolyte is essential, and the concentration which is necessary depends upon the valency of the cation, provided that the salt in question has no deleterious action upon the complement. On the other hand, the effect of polyvalent anions is to maintain the high negative charge carried by the red cells, in which case hæmolysis does not occur.

We have shown that complement, considered as an entity, is negatively charged, and we are of opinion that the nature of the charge carried by the various components is one of the most important factors in the process of complement fixation and certain other immunological reactions.

We propose to deal with the matter more fully in the next number of the *British Journal of Experimental Pathology*.

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Oct. 25.

#### The Second Spark Spectrum of Lead.

THE second spark spectrum of lead was recently analysed by K. R. Rao and ourselves; and a preliminary report of the series regularities discovered was published in a paper (*Ind. J. Phys.*, vol. 2, pt. 4, pp. 468-476.) We have since become aware of a similar publication by Smith (*Proc. N. A. S.*, vol. 14, pp. 878-880; 1928). There is a good agreement between our results and those of Smith, except in the identification of  $1^3P-1^3S$ . Evidently he has our  $1^3S_1$  as his  $1^3\bar{P}_1$ . Carrol has very irregular intensities for the lines suggested by him. The  $1^3S_1$  suggested by us is

supported by the location of the second series  $1^3S-2^3P$ ,  $1^3D-2^3P$ , and  $2^3P-2^3S$ . Furthermore,  $1^3P-1^3S$  suggested by us is given additional support by the closeness with which it follows the irregular doublet law, for the isoelectronic sequences, Hg I, Tl II, and Pb III. An interchange of his levels  $1^3S_1$  and  $1^3\bar{P}_1$  would probably bring the whole scheme into alignment with ours. As a result of our attempts to get further regularities, we have been able to get  $2^3P-2^3D$  and  $2^3P-2^3\bar{P}$  as well.

At the time of publication of the above paper, not much progress had been made in the identification of the singlet spectrum. Attempts have since been made to identify this, and all the important lines arising from combinations between the singlet terms and intercombinations between the singlet and triplet terms have also been identified.

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Kodaikanal Observatory,  
August 1929.

#### Subjective Demonstration of the Existence of the Muscular Sense.

WHEN lying at full length in a bath of water, preferably salt, it is easy to demonstrate to oneself rather strikingly the existence of the muscular sense.

Allow one of the arms to float on the surface which, as is well known, it will do quite easily. When it has come to rest there, make an effort to raise it stretched out from the shoulder-joint. This, if done slowly and with all due attention to it, will appear to require considerable effort. Let the arm once more come to rest, and now proceed to submerge it; again the effort required will be very evident in consciousness.

If similar observations are made with the leg, the sense of effort needed to raise it and submerge it is again strikingly brought out. This purely subjective demonstration of the muscular sense may be recommended as a method of experiencing muscular sensations without the use of the more or less elaborate apparatus of the psycho-physical laboratory.

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Chiswick, W.4,  
Oct. 21.

#### Amphibious Centipedes.

AMONG the Research Items in NATURE of Aug. 3, p. 209, the occurrence of marine centipedes is noted in Madras, other records being the Mediterranean, Atlantic coasts of Europe, and the shores of the Gulf of Mexico.

After a considerable experience of shore collecting, I can add the Cape Verde Islands in 1904, and the Galapagos in 1924. In the former case the centipedes inhabit crevices in the crust of *Melobesia* and *Vermetus* tubes, which covers all rocks at low tide inside bays, as described in the *Proc. Zool. Soc.*, p. 170, 1905; in the second case, large empty barnacle shells, also at low tide level and surrounded by a purely marine fauna. Marine spiders, which I had never seen since I obtained one in Zanzibar, among coral, in 1901, were found here also. The last was described in the *Proc. Zool. Soc.* about 1902, but the other three remain unexamined in the Cambridge and British Museums.

CYRIL CROSSLAND.

Pa'ea, Tahiti,  
Oct. 4.