basis: then climatic, then the profile basis. All are useful, but objection can be taken to all of them. Geological data, however, are invaluable for providing information in respect to water-supply, where it is essential to know the nature and position of the various strata, their permeability and their relation to the ultimate supplies of water. Studies of this kind would be useful in famine areas.

Other problems of soil survey arise in connection with forestry. Forest conservation is an effective way of reducing or even preventing soil erosion.

Problems connected with laterite soil and black cotton soils offer exceptional scope for study in India.

One of the modern methods of soil survey is to have it on the soil profile. Unfortunately, most of the Indian soils I have seen have no very marked profile such as can be seen in other parts of the world. A good deal of soil work is being done in India and it would undoubtedly be a great advantage to put all local surveys on to a uniform basis so that the results can be collated and brought together. It is not necessary to adopt any one basis of classification. Soil investigators are by no means agreed on the matter, and numerous systems have been proposed. The important point at the present time is that the soils should be fully described and that the same methods of description should be used by all Indian workers. Dr. Puri's suggestion is sound that the Indian soil workers should constitute a committee to draw up an agreed basis for describing the soils and should indicate the methods of examination to be adopted. It would further be necessary to arrange for some central body or for some institution to collate the results and prepare the maps and so to put data on record that will be useful to all concerned with soil management and with agriculture.

Mr. Champion read a note prepared by Dr. Gorre with reference to plant cover and said that before deforesting soils for agricultural purposes, sufficient consideration should be paid to the soils, protective and water storage aspects of the natural plant cover.

Practically all sloping grounds in the drier parts of India are of some importance as a source of water to the plains dwellers either for irrigation, town water or electric power, and its efficiency in catching and storing water depends very largely on how for the natural soil profile has been maintained and developed by preserving the natural plant cover.

I submit that any form of soil survey which may be taken up should cater for this method of land use. The survey should register the relative efficiency of the existing plant cover in maintaining the optimum soil profile, and it should also indicate whatever changes are taking place in the building up or degradation of the existing profile. The view-point which regards soils *in situ* as entirely static and permanent will fail to give a record of permanent value because in many areas the soil profile is being rapidly destroyed through bad agricultural and pastoral practices. The soil survey must take cognisance of this fact and one member of each mapping party should be sufficiently erosion-conscious to be able to record obvious tendencies of this nature. The cumulative denudation which is taking place in many parts of the western provinces is leading inevitably to desiccation. By this I do not infer that the total rainfall is being appreciably reduced, but that the ground is being rendered less capable of absorbing the available rainfall.

Blood Substitutes.

THE blood of Vertebrates remains one of the most baffling of animal fluids. While its constitution is fairly definitely known, it has as yet been impossible to simulate it or provide an efficient substitute for it. And seeing that almost every day the need for an adequate substitute for blood is felt by the doctor, by the physiologist and by the biologist, it appears that our efforts to provide them with a successful blood substitute need to be intensisfied.

The literature on the subject is vast and extensive. With a view to find a working substitute for blood because of its great importance in clinical practice, biologists, chemists and medical men have been trying for a long time to systhesise a substance which may take the place of this fluid in the Vertebrate body. History goes back to the middle of the last century when the first attempts were made to replace the blood of frogs by salt solution. Since then the accumalation of literature has become very extensive; W. R. Amberson[1] has recently provided an illuminating review on the subject.

The first and foremost point of importance to be remembered in the study is that there has to this day been no complete substitute for bloods. In all the substitutes so far known some constituent of normal blood must be present. Nor is it possible to imagine,—let alone make,—a substitute for hæmoglobin. All our efforts must therefore rest in an attempt to make but the vehicle in which must be present hæmoglobin, either in a state of suspension or in the form of red cells.

A variety of conditions are to be fulfilled if a substitute for blood can be practicable, the most important of which are the ability to maintain an adequate pressure and volume and a tendency of the materials constituting the fluid not to leave the blood stream. These two are indeed the prime difficulties in the making of any fluid substitute for blood, for in many of them, either the required volume and pressure are not maintained or else, the materials of the fluid tend to leave the blood stream quickly,—very often in the course of a few hours.

Red cells are not a necessary constituent of blood but hæmoglobin in solution must be present; then, blood will be performing the dual function of maintaining the osmotic pressure and carrying oxygen,—a duality not found in any vertebrate,

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[1] *Biol. Rev.*, January 1937, **12**, No. 1. 48.

though in many invertebrates where the hæmoglobin is in solution, this is possible. Experimental evidence shows that in vertebrates, this condition of dissolved hæmoglobin in blood is not workable, for hæmoglobin tends to leave the blood vessels quickly, passing into lymph to be taken up by the cells of the reticulo-epithelial system. It also becomes changed into methemoglobin so that it is not possible to maintain life after 36 hours.

Of the blood substitutes to be considered here, the most ancient but the least efficient are solutions of crystalloids which are apparently useless as substitutes as they leave the blood stream quickly and are unable to maintain blood volume and pressure. Isotonic sodium chloride solution with or without the addition of citrates and lactates has been used extensively and while differences of opinion still exist regarding the efficacy of these solutions. it is almost certain that none of these solutions can maintain life.

The next in importance are substitutes like blood plasma and blood serum which contain sufficient colloidal material to give osmotic pressure approximating to that of normal blood. Of these, blood plasma is preferred to blood serum on account of the fact that in the latter vaso-dilator and constrictor substances are found in the act of clotting.

The only effectve and practical substitute are carefully prepared gum-saline solutions with suspended, washed red cells from the same species. First used by Carl Ludwig (1863), the importance of gum-saline substitute was realised during the Great War when large quantities were used in clinical practice. Gum-saline has a number of inherent difficulties which greatly minimised its importance. The great sedimentation rate caused by it and the tendency of gut to coat the red cells thereby reducing their ability to combine with oxygen are two of the most outstanding. Added to this, there is evidence to show that gum leaves the blood stream and cannot maintain the colloidal osmotic pressure longer than 48 hours and that gum tends to get fixed in certain organs, especially the liver, thereby diminishing the concentration of the plasma proteins by blocking the liver. But these are comparatively minor difficulties and the author's own researches lead him to conclude that next to blood plasma this is the most effective substitute and in hospitals and clinical laboratories all over the world, the use of gum saline is on the increase. Gelatine saline which has sometimes been used is incapable of acting as a substitute because gelatine leaves blood quickly and it tends to hasten coagulation and intravascular clotting.

SCIENCE NOTES.

Wood is Good.—(*Bulletins of the Timber Development Section of the Forest Research Institute, Dehra Dun*) by S. Kamesam, M.I.E., with a Foreword by H. Trotter, Dehra Dun, 1936.

The *raison d etre* for this series of Bulletins is best summarised by Captain Trotter in his Foreword to the series as follows: "In the past, steel and concrete have been looked upon as the chief structural materials of the engineer. This has been due to the fact that these two materials have been widely advertised and strongly assisted by powerful organisations, whereas wood being nobody's child has gone by default."

Though the Bulletins are frankly propagandist, it is recognised that "there is a right and wrong place for everything....All we ask is that it should be given a fair hearing....".

In more advanced countries, organisations like the Timber Development Association of England undertake this kind of propaganda. In the absence of any such institution in India, the Forest Research Institute is devoting more attention to this aspect of publicity work none too early; for, on account of the persistent, intensive and subtle advertising campaigns by rival structural interests, timber has a lot of leeway to make up.

The Bulletins are singularly free from abstruse technical terms and what is perhaps more important from overstatements and exaggerations. The crisp narrative is all the more effective on account of its direct simplicity. One could however wish that the get-up of the Bulletins were more in consonance with the large stakes involved in the adequate ultilisation of Timber.

"Wood is Good" Bulletins supplement and form a very necessary counterpart to the technical publications of the Forest Research Institute.

EMMENNAR.

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The Preparation of Alumina and Sulphur-Dioxide from Bauxite Gypsum Mixtures.—[By V. S. Dube, M. B. Rane and M. Kanakaratnam. *Bulletins of Indian Industrial Research*, 1937, No.6.]

This paper describes the results of experiments in which mixtures of bauxite and gypsum in different proportions were heated to temperatures ranging from 1000° to 1280° for periods varying from 2 to 8½ hours. 2 g. of the bauxite were employed in each experiment (except in one experiment, wherein 5 g. were taken), and the proportion of bauxite to gypsum in the mixtures ranged from 3 : 1 to 1 : 3. The furnace employed for the work was of the coal-fired muffle type and is reported to have been maintained at the required temperature for a specified time with a variation of not more than 10°.

It was found that the reaction between bauxite and gypsum was appreciable at 1000° and complete at 1250°. The most suitable conditions for the preparation of alumina from bauxite and for the complete explusion of sulphur trioxide from gypsum were found to be present when mixtures of bauxite and gypsum in the ratio of 2 : 5 were heated to 1200°—1250° for a period of 6 to 7 hours.

K. R. K.

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The Jewish Communities of Cochin, India; their Racial Affinities.—At the ordinary monthly meeting of the Royal Asiatic Society of Bengal, held on Monday, 5th April, EILEEN J. W. MACFARLANE