of serum and organisms the cohesive force remains constant, but the potential and therefore the repulsion between the organisms is decreased until it is less than the cohesive force and agglutination therefore occurs. When, however, the serum is added to the organisms in the presence of sufficient salt so that the potential is less than 13 millivolts, the cohesive force is increased with increasing concentration of serum until it is greater than the repulsion due to the potential (which is not affected by the addition of the serum) and agglutination again occurs.

INFLUENCE OF THE p_H

It was found that the acidity of the solution markedly affects the amount of either normal or immune serum required to cause agglutination (when the organisms are suspended in low concentrations of salt). The nearer the isoelectric (acid agglutination) point of the organism the less serum is required for agglutination. A determination of the amount of antibody combined with the organism, however, showed no increase in this range. The number of units combined was the same from p_H 3.5 to p_H 8, although the amount of serum required to cause agglutination varied tremendously over this range of p_H. The same amount of antibody when combined with the organisms therefore evidently has a far greater effect in this range of p_H than it has farther from the isoelectric point or else other constituents of the serum have a greater effect near the isoelectric point of the organism. In any case, there seems to be no connection between the sign of charge of the antibody and organism and the combination between the two. This experiment indicates that the serum or protein forms a film on the surface of the organism which then reacts like a particle of the pure protein. A similar mechanism was suggested by Coulter[4] to account for the effect of serum on the acid-agglutination point of red blood cells.

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[4] Coulter, C. B.: *J. Gen. Physiol.*, 1921-22, iv, 403.

THE WORK OF U. S. GEOLOGICAL SURVEY

EXPLORATIONS for potash, investigations and explorations of present and possible oil and gas fields, of coal fields, and of ore deposits and mining districts, paleontologic researches, work in chemistry and physics, and investigations of surface and underground water resources are among the year's activities of the United States Geological Survey as mentioned in the annual report of the director, just made public. The number of employees in the Geological Survey holding regular appointments was 877; most of them are field men whose varied work ramifies into every state, in addition to Alaska and other outlying territory of the United States. Besides these a small host of temporary camp field men were employed—rodmen, teamsters, cooks, etc. Some of the most important things that the Geological Survey has to show for its work are geologic surveys which cover a wide scope of practical and scientific activity, embracing 32 states; topographic mapping in 21 states covering 13,544 square miles and including more than 5,000 miles of levels and primary traverse lines; more than 11,000 measurements of stream flow in 31 states and investigations of underground waters in 10 states.

The survey also acted on more than 25,000 cases referred to it in connection with the administration of the public lands; and made a decrease of 3,914,000 acres in outstanding government coal reserves, of 110,000 acres in outstanding petroleum reserves, and of 298,000 acres in phosphate reserves. There was, however, a net increase of 268,000 acres in the area classified as phosphate land. The present acreages classified and reserved by the government as coal, petroleum, oil-shale and phosphate lands are: Coal, 65,000,000; petroleum, 6,500,000; oil-shale, 4,100,000; phosphate, 2,700,000. The survey also made a net increase of 635,000 acres in power-site reserves, designated 382,000 acres in Nevada under the ground-water reclamation act, and made net increases of 5,700 acres in public water reserves, of 3,989,000 acres in enlarged-homestead designations, and of 4,778,000 acres in stock-raising homestead designations. The Washington office distributed 602,000 copies of book publications

and 695,000 maps, of which 562,000 maps were sold.

The Geological Survey is a scientific bureau which has to do with the mineral resources of the earth rather than with men. Therefore it is known to but comparatively few, for to most people its reports seem to lack human interest. The work of its large topographic force, for instance, is recorded in lines on paper—maps—which do not lend themselves especially well to columns in the newspapers. Where the Geological Survey leaves off others take hold. Thus the geologist may carefully explore and outline on a map the structure of an oil field, and so advise the wildcatter where or where not to drill; yet little public interest attaches to the region until the oil man sets up his rig and begins to drill. So it is with all the work of the organization; it is basic, foundation work, upon which many kinds of development may rest later, after the Geological Survey has moved on to new fields of investigation.

An example of the forward-looking policy of the Geological Survey is seen in its anticipation last winter of the coal strike, when as a measure of preparedness, in cooperation with the census, it made an inventory of the amount of coal stored in the United States, and also prepared and published a map of the United States showing the coal mining districts.

The work of the Geological Survey in connection with oil, says the director, continues to be of increasing value, and the application of geology to practical affairs is shown by the fact that in four oil fields that have been extensively developed the early geologic mapping indicated the existence of oil in the ground, which was later proved by commercial development. Other activities of the Geological Survey included examination of deposits of oil-shale in four states; comprehensive studies of the Colorado and San Juan rivers in Utah and Arizona with reference to reservoir sites; the completion of studies of radium-bearing carnotite ores and tungsten deposits of the United States; the preparation of timely reports on the production of coal and other fuels; making nearly 2,000 detailed analyses of rocks and minerals, and 700 analyses of surface and underground waters; the preparation of special physical and shaded relief maps of Alaska, California, Kentucky and several other areas; continuation of the preparation of the United States portion of the international map of the world, for which maps of 46 states have now been completed and are on sale at nominal prices; the preparation of monthly reports on the production of electricity and consumption of fuel by public utility power plants; and the publication of maps of 14 states showing the location of power sites and transmission lines. These in common with all the 3,000 or more different maps of the Geological Survey are for sale at nominal prices.

SCIENTIFIC EVENTS

VITAL STATISTICS OF PRUSSIA BEFORE AND AFTER THE WAR[1]

THE Prussian Statistical Department issued last year the second part of Vol. 10 of *Medizinalstatistische Nachrichten.* It is a comparative study of the last complete pre-war and the first complete post-war year (1913 and 1919). Prussia is closely comparable with England and Wales in population, and as it has been exposed to different wartime and post-wartime conditions, it is interesting to compare the results. The estimated population of Prussia in 1913 at all ages was 20,596,269 males and 21,052,793 females. In the first completed post-war year (1919) the census showed a decrease in the males to 18,816,849 and females to 20,523,598. The mean age of males in 1913 was 26.6 years, and 28.7 in 1919. There was very little change in infant mortality, the death rate per 1,000 births in the first month of life being 48.7 for 1913 and 48.3 for 1919. The births numbered 1,209,385 in 1913 and 827,335 in 1919, giving rates of 29.0 and 21.0 per 1,000 living. In England and Wales the birth rates were 23.9 per 1,000 living in 1913 and 18.5 in 1919, and the death rates in the first month of life were 44.39 and 44.49 per 1,000 births. In both countries there was an increase in the deaths in childbed, but the third wave of the great pandemic of influenza in 1919 may be assumed to account for some increase. In Prussia the decline in infantile diarrhœa was considerable; the mortality under 1 year was 134.6 per 10,000 live births in 1913 and 44.55 in 1919. Excluding typhoid fever and influenza, the infectious diseases showed a decrease. The

[1] *The British Medical Journal.*